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Electrical World

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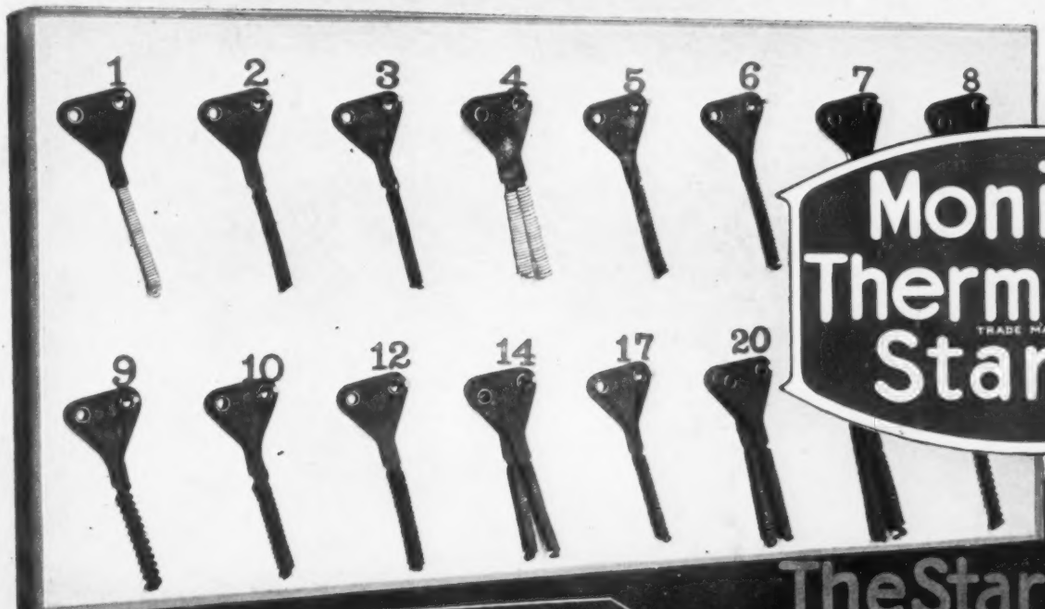

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Starter

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the Key rack
Storeroom

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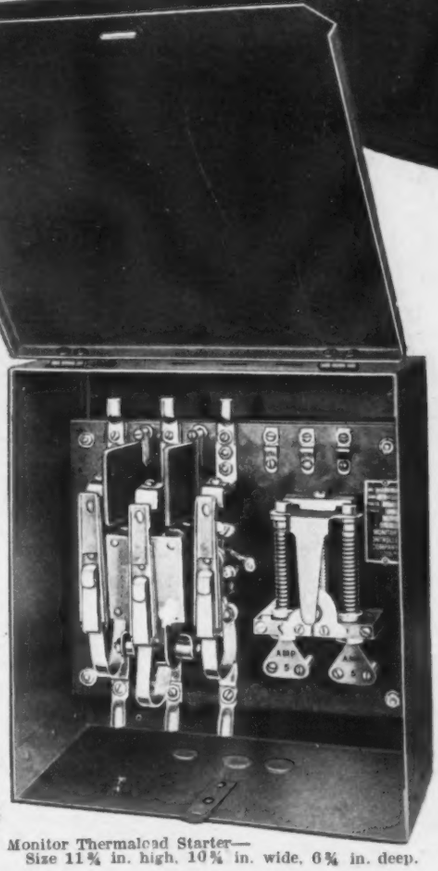

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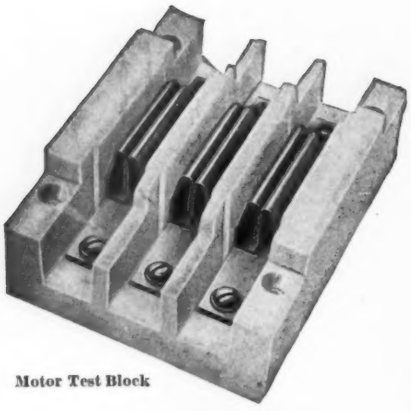

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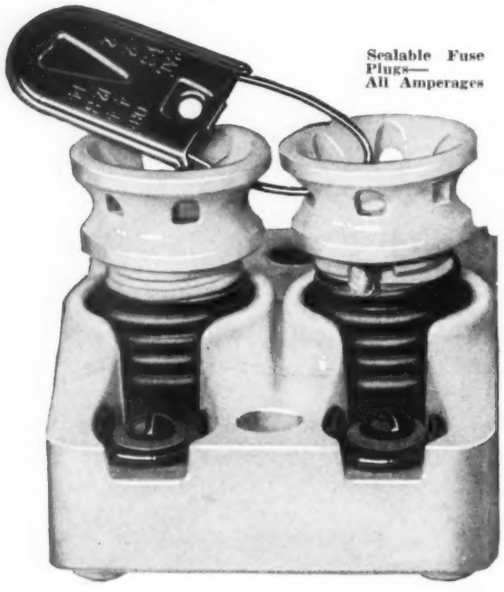

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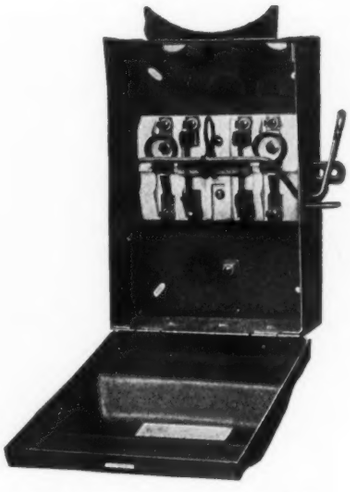

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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Volume 79 *Number* 22

Secrecy in Manufacturing

OLD superstitions die hard, and while they linger some of them do harm. Such a superstition, for instance, is the idea still prevalent among many manufacturers that each must maintain a set of secrets, mysteries alike to their customers and to their competitors. The influence is hurtful past all calculation.

It is a matter just now worth the attention of the manufacturers of the electrical industry because it offers an obstacle to the development of that very program of promotion in which all have become so interested. It is another public relations problem no less important than that which marks the contact of the utility with the local public.

TIME was when each manufacturer made his goods in his own way. His line was individual and different. His methods and his processes he guarded jealously. But those were other years, before the mail, the telephone, the express and the traveling salesmen had knit the world into a unit and each manufacturer had become an element in a common industry with a national distribution and influence.

The days of the close mouth have passed. The era of publicity and frank sincerity is here.

Behind each manufactured product lies a human story of vision, ingenuity, persistent skill and enterprise. The manner in which that product was conceived, designed, perfected and then evolved through further gradual improvement is of interest to each customer. The method of manufacture, the quality of materials and workmanship are clear to every competitor who investigates.

For as long as employees change jobs and talk, as long as salesmen gossip, the facts will be known. Only once in a thousand times is such a secret possible or necessary; for personal contact, confidence and understanding are still the greatest influence in business.

THE manufacturing executive should be as accessible to the man of his industry as the central-station manager should be to his community. He should encourage his customers, their trade and his competitors to visit his factory and see what his goods are made of and how. He should talk freely to these friends and put behind his products all the strength of the human story that they represent. He should make his problems and his achievements known, because, after all, they are not his alone but the concern of all his industry.

Electrical men of all branches of the industry have proclaimed a national movement for the development of business. It must carry the message of electricity to all men. But if the work is to be done in any big and satisfying way, complete co-ordination must be realized within our own ranks. And to accomplish this we must all lay secrecy aside and understand each other.

Owen D. Young

A lawyer and executive whose ability in the realm of corporate organization has had an important effect on the progress of electrical development.

IN SUCCEEDING C. A. Coffin as chairman of the board of the General Electric Company O. D. Young stands at the head of the largest electrical organization in the world, an organization whose ramifications take it into almost every place of electrical endeavor. By training Mr. Young is a lawyer. His practice has all been in corporation cases, and in this connection he has for years stood among the leaders of his profession. In the last ten years, during which he has been a vice-president of the General Electric Company at the head of its legal department, his great ability in corporate organization has had a wonderful manifestation in the electrical industry. In not a few cities where the utilities had been unable to make any progress because public sympathy had been alienated Mr. Young has been able to heal the breach and once more bring about order. He has been an apostle of friendly relations with the public and employees and an advocate of the London sliding scale of rates, modified in each instance to fit the local situation.

His latest corporate triumph, and what by many is considered his greatest effort in the electrical field, was the creation of the Radio Corporation of America, of which he became chairman of the board. Here he amalgamated divergent factors and reconciled opposing factions and as a result built an organization which stands as a monument of national and international progress in the field of communication. It might be noted that had the Radio Corporation of America not been formed as and when it was, radio communication, instead of remaining in the hands of American interests, might have become another British monopoly owing to the governing influence of the British Marconi Telegraph Company interests in the American Marconi Company.

During the past year Mr. Young has given attention to the building of an international radio system with a comprehensive and adequate scheme of standardization, the results of which are bound to have a profound influence on the progress and development of radio communication.

His happy faculty of getting individuals and organizations to co-operate is finding expression in the counsels of the joint committee on telephone interference. The progress already made by this committee has given heart to both the telephone and the light and power interests because it is showing a way whereby this problem can be handled in a friendly manner.

As a member of both of President Wilson's industrial conferences Mr. Young served ably to bring capital and labor into more harmonious relations with each other. As permanent chairman of the committee appointed by Secretary Hoover, he is studying ways and means of minimizing the effects of non-employment.

Mr. Young is a comparatively young man to hold such an important position. He was born in Vanhornesville, N. Y., Oct. 27, 1874. At the age of twenty he was graduated from St. Lawrence University and in 1896 from Boston University, where he studied law. That year he started to practice and later became a member of the firm of Tyler & Young of Boston. His work with this firm was of such a high order as to attract unusual attention. Among his clients were Stone & Webster, for whom he solved many complicated problems. Since his association with the General Electric Company he has naturally been closely identified with the direction of its many subsidiary and affiliated companies.

Editorial Comment

Electrical World, June 3, 1922

Volume 79 Number 22

Money Again Under 6 per Cent

CONFIDENCE in electric light and power company securities is still growing. A year or more ago 7 per cent would have been a low yield on a good bond. Many excellent issues came out at a rate of 8 per cent or higher, and even then a ten-year to fifteen-year non-callable period was required. Now, it is seldom that the yield goes above 7 per cent, and some issues are under 6 per cent. In the last two weeks two issues, one for more than $12,000,000 and the other for $7,500,000, have been offered at under 6 per cent, the former on a 5.70 per cent basis and the latter on a 5.53 per cent basis. What is more surprising, a 5 per cent issue came out last month at a substantial premium so that the yield was down to 4.70 per cent. This bond happens to be a legal investment for Massachusetts savings banks, but even so it is indicative of the future.

With money becoming so reasonable in price, it seems about time for those companies that floated 7½ and 8 per cent issues to begin figuring on some refunding. Just at present the investment market is hungry for electric light and power company securities.

Railroad Rate Reduction an Expedient of Doubtful Value

THE order of the Interstate Commerce Commission effective July 1 cutting freight rates 10 per cent will mean a saving of from 10 to 30 cents per ton of coal consumed by electric light and power companies. Nevertheless, unless the reduction is justified by an increase in railroad business it would be better if it had never been made. No public utility seeks to profit at the expense of some other utility, nor can any utility acquiesce in a rate reduction predicated mainly on hope. When it can be shown that the railroads are earning too much money it will be time enough to cut rates. Business must be in a bad way when it will stoop to accept gratuities from the Interstate Commerce Commission.

The financial condition of the railroads is none too good though they are said to be making some money now. If they can operate and grow under the rate reduction, so much the better, but it is idle to expect any great demand for railroad securities paying perhaps 5½ per cent and perhaps not, when better bonds paying more are procurable. It would have been far wiser to enable the railroads to get on their feet first than to curtail their incomes at this critical time. We want transportation, and, as Herbert Hoover has said, we want it with the values of private initiative and clean public service. To shake the confidence of the public in railroads as an investment, therefore, can mean only a dearth of funds, and if the railroads lack funds, business will discover that they will fail it when it needs transportation. High commodity and labor costs still plague the railroads, and to expect them to absorb any great loss in revenue due to lower freight rates is to expect the impossible. Our railroads have been kicked about and experimented with enough. It is about time that those skilled in transportation be given a freer hand and a little encouragement.

Reorganizing for Business

IT HAS taken some time for the manufacturing branch of the electrical industry to arouse itself to a full appreciation of the necessity for fighting for business. While every one has agreed for a long while that goods will no longer be purchased but that they must be sold, few have had the courage to take the plunge into reorganization which the situation demanded.

During a period of seven years many organizations and many men went to seed, principally because the stimulus of competition was lacking. A good housecleaning therefore is necessary. It is very unpleasant to shelve men and replace old with new—to put on the pension list men with whom you have been associated for years but who have neglected to keep in fighting trim. Still, with a great many concerns, it's that or the graveyard for the company. There is a tremendous amount of business to be had, but it must be developed.

Some manufacturers have already done their reorganizing and they have been the first to feel the effects of returning business confidence. It is a pleasure to note that others are now getting on the band wagon. However, the great mass of manufacturers have neglected to take the human inventory. If they delay too long, they will wake up some fine day to find a reorganized competitor picking all the plums. The sad part is that frequently those concerns which wait until business is lost before they put their forces in fighting trim suddenly seem to go insane. Without weighing men or stopping to find out where individuals can function best, the whole force is dispensed with and a new lot put in their place. Sometimes this produces business, but more often it loses business through the bad relations which it engenders.

There is an old saying that "Time and tide wait for no man." This might well read, "Business waits for no reorganization."

Engineering Courses and Our Secondary Schools

THE action of the deans and other representatives of fourteen engineering faculties in the Middle West in recommending the addition of a fifth year to technical courses of study for the benefit of ambitious students, those who complete it to gain a degree outranking that conferred on four-year graduates, is quite in line with the theories of modern educationists, who, alike in arts and in technology, are far from satisfied with the attainments of the average college graduate.

The deans desire to "remodel the present four-year engineering curriculum, substituting a substantial proportion of humanistic and fundamental subjects in place of an equivalent amount of advanced technical work," and deferring the student's choice of his special branch of technical study until the end of his second year. Like the professors of other subjects, they are, if not dismayed, at any rate perturbed by the immaturity of the freshman and his sometimes amazing ignorance of what he is supposed already to have learned.

It is impossible to quarrel with the educators for their insistence on a longer course. Probably this is the only way to turn out reasonably well-rounded men. Yet the tendency constantly to prolong the time of preparation for the work of life forms in itself a problem. The normal elementary-school, high-school and college courses consume sixteen years, or a quarter of a reasonably long span of existence. It would not be necessary to add to this period of waiting were the work of our secondary schools done better. Far too often the high-school graduate is only where the grammar-school boy should be. Were the former possessed in fact, as he is in theory, of the fundamentals of culture, were his taste for literature or for philosophy or for languages developed, as it might be, so that he could and by self-compulsion would pursue further these pleasant and little arduous studies, with or without the stimulus of college discipline, is there any reason why, at eighteen or nineteen years of age, he should not bend his main energies to engineering studies if through these lies the path to his individual goal? A hundred years ago men knew little of modern science, but at the age our sons enter college they often left it walking epitomes of the subjects that cause so much twentieth-century despair.

Path to Higher Plant Economy Leads Through Refinement of Details

NO RADICAL departures from mechanical practices are apparent in Calumet station—the latest plant of the Commonwealth Edison Company—but every effort has been made to refine equipment which has given satisfactory service in the past and to insure the highest economy of operation by careful attention to the smallest details. The most striking feature of the boiler plant is the use under one boiler of a forced-draft chain-grate stoker of unusual proportions in place of the two grates per boiler that have been employed under the other boilers of the plant. The use of these stokers will be watched with interest.

Another thing of interest is the fact that experience so far with the new plant has indicated that three 15,089-sq.ft. boilers are amply able to serve one 30,000-kw. turbo-generator.

The steam pressure and superheat adopted—namely, 350 lb. and 250 deg.—show the present tendency toward higher pressures, although the pressure cannot be called radical even though it is above the pressures in present use in the majority of cases.

Every effort to conserve heat that might be lost through drips and other paths has been made in addition to careful provisions for maintaining the heat balance and preventing the larger losses of heat. To assure proper feed-water temperature under all loads facilities are furnished for bleeding the low-pressure stages of the prime movers. That the provisions have been successful is evidenced by the fact that, with the plant as yet not fully completed, it has been possible to put a kilowatt-hour on the switchboard with a fuel consumption equivalent to 18,000 or 19,000 B.t.u.

Present conditions indicate that the path toward greater economy in steam-plant design and operation lies in the direction of refinement rather than totally new things although it may be recalled that this station is also noted for being a pioneer in isolating its phases.

The Optics of the Electric Sign

THE paper which we published last week by C. A. Atherton regarding the legibility of electric signs is one of the neatest pieces of practical investigation which we have had the pleasure of presenting for some time. In a general way the electric sign has been pretty well exploited and its principles have been in a measure understood. But the questions of brightness, spacing of lamps, size of letters and nature of background have not until now been correlated with reasonable precision. The great fundamental principle of design is that legibility at a distance depends in the last resort chiefly on the size of the letters, assuming that they are of reasonably normal proportions. It is somewhat conventionally assumed that details lying closer together than one minute of arc cannot be separated but merge in a common blur. From a practical standpoint one minute is a considerable understatement of the facts, and in practice, even where the intense brilliancy of the electric lamp is not concerned, the distance is much nearer two minutes than one, and in most circumstances details separated by even three minutes are likely to be indistinguishable to the average eye. Under ordinary conditions, moreover, the phenomena of irradiation operate adversely in increasing this critical distance so far as legibility of a distant letter is concerned. Irradiation causes lights in the same line of the sign to blend at a lesser angle of separation than the normal. This may be helpful, but it also causes blending of the details of the letters at an abnormally short distance.

Mr. Atherton has done extremely good work in obtaining a well-defined empirical relation for the apparent size of the spot of light furnished by a lamp as a function of its distance and brightness, giving thus a good measure of the irradiation of an intensely brilliant object like an electric lamp. The effect of this is startlingly great, as some of the data given by him show. At an approximately given degree of contrast the legibility is a fixed quantity determined by angular extent. White on black and black on white differ very little in legibility if the relative contrast is the same, but black on white paper and electric light on the black background of sign or sky disclose an entirely different situation, and irradiation comes in at its full value. This is the reason why it frequently happens that decreasing the candlepower of the lights in the sign increases the legibility in a very notable degree.

At extremely long distances, where the irradiation is relatively very conspicuous, the atmospheric absorption may be great and may actually help out legibility, as Mr. Atherton's experiments show. Surrounding illumination furnishing an illuminated background, particularly in the case of haze, generally cuts down the distance of legibility, other things being equal, just as the lights of a city cut down the clear brilliancy of the stars. On the whole, it is wise in designing a

sign for ordinary conditions of visibility to assume a greater quantity than one minute of arc as the critical distance of separation, to make the letters as big and open as possible and to use rather small individual lamps. If the location is such that there is not likely to be trouble from a background conspicuously luminous or from the glare of neighboring lamps, there is not likely to be any trouble from lack of brilliancy in the lamps. The contrast between a line of lamps spaced under the critical distance on the background of night is sufficient to carry legibility very far even if the lamps are individually of small candlepower. It is only in thick weather that the light of powerful lamps is sufficiently dimmed by the atmosphere to make escape from this serious trouble from irradiation possible.

There are many interesting theoretical points brought up in Mr. Atherton's admirable paper, but its fundamental value lies in the very plain information given to the designer of signs for obtaining the best results with the material at hand.

Guide to Maximum Utilization of Transformer Rating

THE accurate indication of the maximum temperature of oil-immersed transformer windings presents an interesting problem in that the temperature of the windings depends not only on the load but also on the temperature of the surrounding ambient air. In those installations in which the ambient temperature does not change greatly and in which the load is known, either by instruments or otherwise, the load itself may be a sufficiently close indication of the temperature of the windings. However, in out-of-door installations in which the ambient changes over a wide range, and in the cases of isolated transformers including those of ordinary low-voltage distribution, dangerous temperatures may arise, and it has become of importance that a temperature indicator or hot-temperature signal be available. Considered alone, the temperature of the oil in the case may not be relied on, although, as L. L. Elden pointed out in these columns recently, a point can be formed in the surface oil where the temperature does follow the hot spot temperature at an approximately fixed differential. To obtain a reliable indication of the true hot-spot temperature, the temperature of the surface oil must be corrected.

Two devices with the above-mentioned object were described in the report of the electrical apparatus committee of the National Electric Light Association, presented at the Atlantic City convention. One consists of an indicating-dial-type thermometer with its bulb placed inside a small heating coil immersed in the hot surface oil. This heating coil carries current proportional to that in the main winding. Its windings are worked at the same current density and its insulation is proportioned to give the same elevation in temperature of the heating-coil windings above the surrounding oil as of the windings of the main transformer.

The second device corrects the oil temperature in its relation to the ambient temperature by means of interlinked bimetallic strips, one immersed in the hot oil and the other outside the case. Differences between the temperatures inside and outside result, through the motion of the linkage, in the tripping of an indicator which may be adjusted for different values of limiting internal temperature.

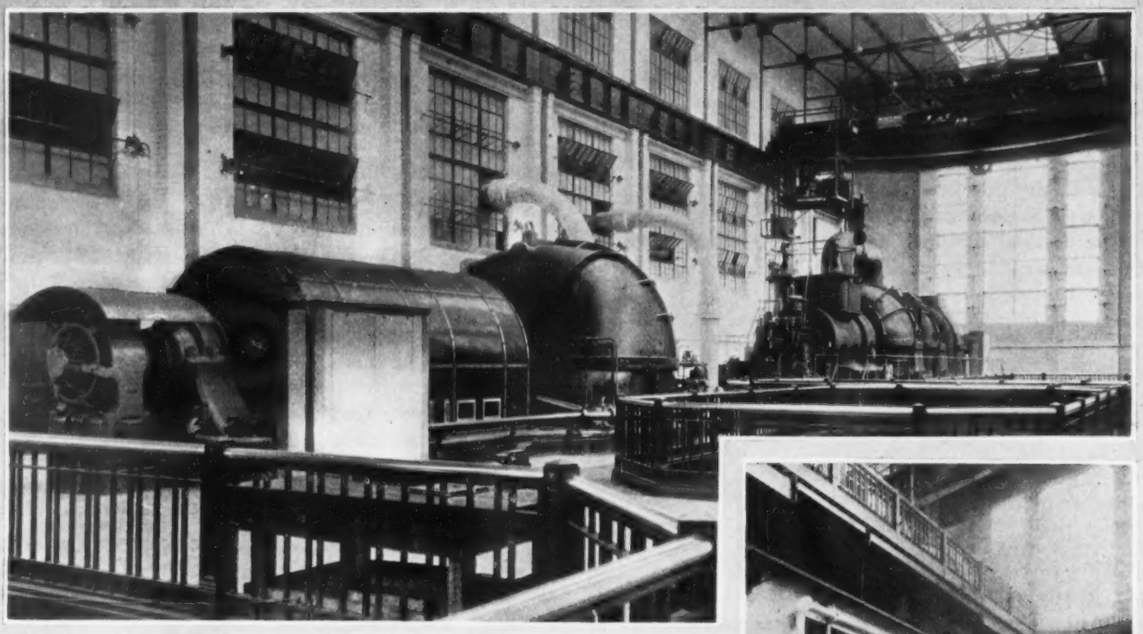
The indications of each device are obviously approximate only, but they are very satisfactory substitutes for coils and thermocouples located within the structure of the transformer itself, in that they avoid the complication and dangers attendant upon the use of the latter methods.

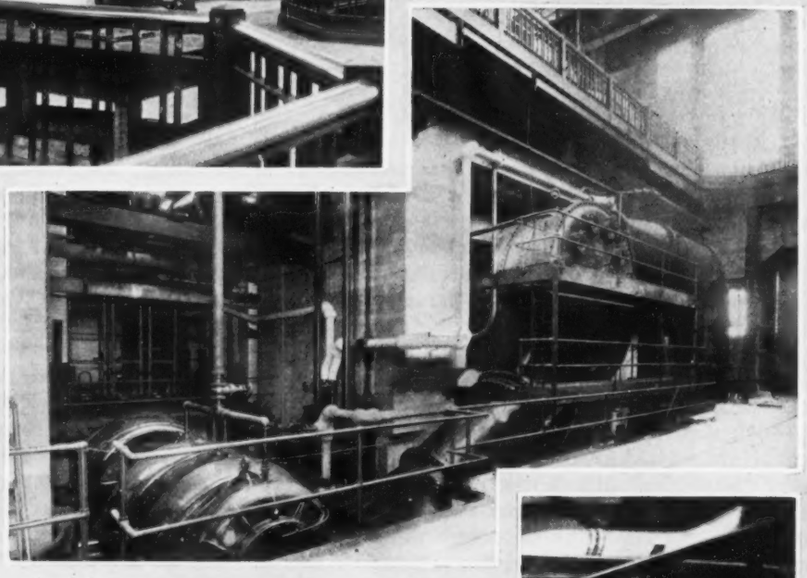
Compensated Spark Gap an Important Improvement

FOR the major equipment of a power system—namely, generators, transformers, conductors and similar apparatus—it is possible to predetermine and control the load demands. Consequently close design and accurate anticipation of performance are also possible. Another class of equipment, however, embraces machines for which it is impossible completely to estimate the service requirements and which, moreover, are expected to withstand attacks of unexampled suddenness and violence from unseen and unknown foes.

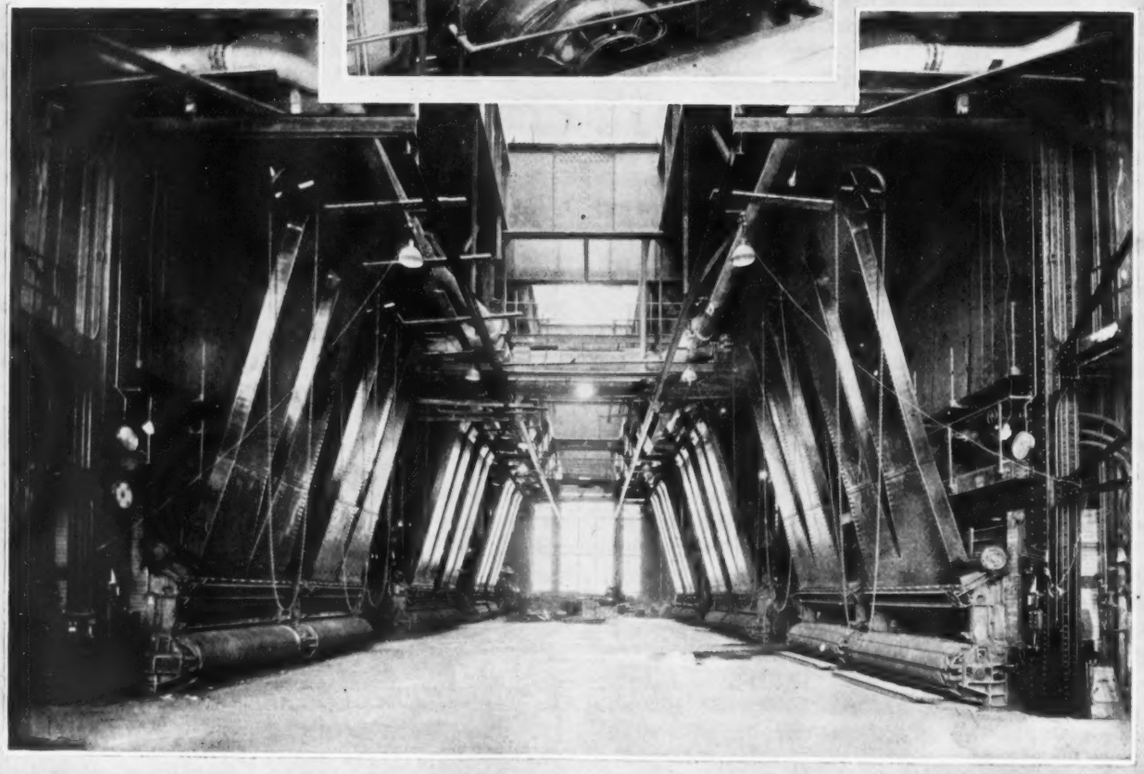
The lightning arrester is the object of the widest variety of these obscure attacks. In neither of its chief functions, that of discharging promptly over the entire prevalent voltage range and that of suppressing the resulting dynamic short circuit, has it yet reached a stage of development which can be called satisfactory when compared with the stage or stability of development of most other types of electrical equipment. The ideal arrester would be one that would discharge for any voltage rising slightly above the normal line value. Unfortunately, the ordinary spark gap, an indispensable adjunct of all high-voltage arresters so far developed, discharges at varying values of voltage for the different frequencies arising in line disturbances and suffers a further difference in performance as between wet and dry conditions. The gradual recognition of these influences has resulted in a progressive change of design, beginning with simple points and cylinders, passing through the horn gap and various modifications, and culminating in the protected impulse sphere gap. The special feature of the impulse gap is that its setting is approximately constant for all frequencies under dry conditions, but it must be protected from wet weather.

An admirably ingenious effort at a further improvement of the spark gap was described in the article by C. E. Bennett which appeared in last week's ELECTRICAL WORLD. In this new form effort is made in the design to compensate for the variations in the two disturbing factors, namely, lightning frequency and wet conditions. The principal feature is a porous porcelain disk, non-conducting in dry and conducting in wet weather, just back of each of the central discharge points. This disk when wet has the effect of increasing the radius of curvature of the discharge points and hence of offsetting the reduction in sparkover value ordinarily experienced in wet weather. At the same time, the gap retains the desirable characteristics of the impulse sphere gap as regards varying impulse frequency. The reports of tests on the new gap are still, of course, comparatively meager. Further performance data to answer individually the many questions which must be answered before a general acceptance will be accorded to it are desirable. A natural question, for example, is what happens when the porcelain shields become saturated in sustained drenching rain. However, both principle and performance so far quoted appear to indicate an important improvement in spark-gap design.





**Calumet—
the Latest Station
of the
Commonwealth
Edison
Company**



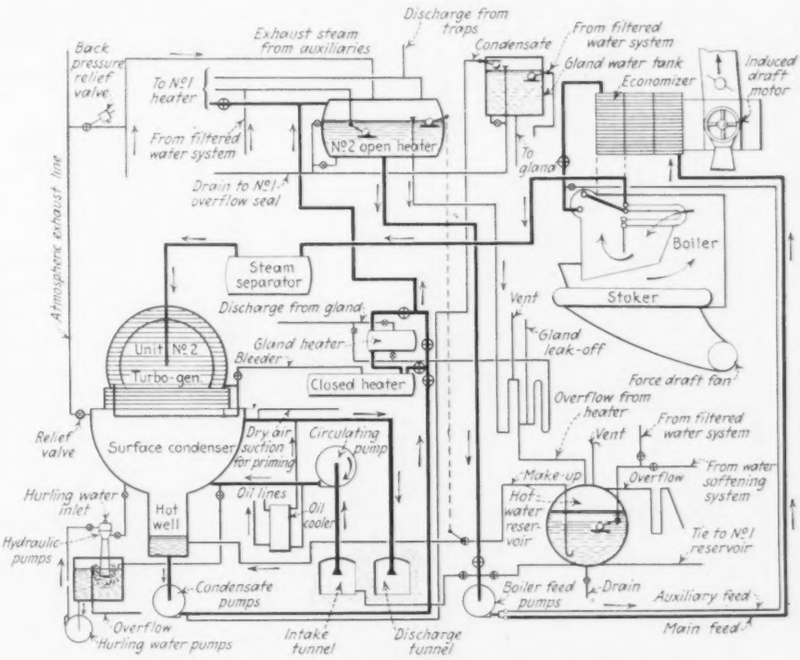
Calumet to Reinforce Industrial Section of Chicago System

This New Station of the Commonwealth Edison Company Has 15,089-Sq. Ft. Boilers with Integral Economizers and Forced-Draft Chain Grates—Steam Is Bled from Prime Movers for Heat Balance

SITUATED in the southeastern section of Chicago on the Calumet River, the new Calumet station of the Commonwealth Edison Company is on a site where it may be expanded to mammoth proportions and where it will also reinforce the portion of the system which is undergoing considerable industrial growth. Its position with relation to the other major stations on this system—namely, Fisk and Quarry Streets stations and Northwest—assures Chicago of a very dependable supply of energy. As originally planned, the new station was to contain six 30,000-kw. units, aggregating 180,000 kw., but already there is talk of eight units, and possibly more, if conditions warrant, and there is a possibility that later units may be of larger capacity. Two 30,000-kw. generators have been in operation for the last few months and the installation of two more units is under way. Though the station is chiefly of interest because of the phase isolation in the electrical part of the plant (discussed at length on page 761 of the April 2, 1921, issue of the ELECTRICAL WORLD), there are a number of mechanical features which differ from those in other plants built recently. For example, boilers with integral economizers are employed and designed for 350-lb. (24.5-kg. per sq.cm.) pressure and 685 deg. steam temperature. Large forced-draft chain grates are employed, and some departures have been made in furnace construction. The coal-handling arrangement is somewhat unusual, a coal breaker being used instead of the customary roll crusher. The heat balance is maintained by operating enough steam auxiliaries to heat the base load feed-water requirements and by bleeding the prime mover for additional steam.

To afford plenty of room for coal storage and future extensions to the plant a site of 43 acres (17.4 hectares) was selected. Of this space enough will be reserved for an ultimate storage of 150,000 tons of coal. Tracks will be provided with a steam locomotive to handle the cars and a locomotive crane to transfer the coal to and from storage.

As may be observed, over 70 per cent of the plan area of the building is devoted to the boiler house and coal-handling equipment, and if heights are considered, the relative volumes show a still larger ratio for the steam-generating end of the plant. Reduced to floor area per kilowatt installed, the boiler room occupies 0.52 sq.ft. (0.04 sq.m.) per kilowatt, the turbine room 0.195 sq.ft. (0.018 sq.m.), the transformer house 0.057 sq.ft. (0.005 sq.m.), and the switch house 0.13 sq.ft. (0.01 sq.m.), making a total of 0.9 sq.ft. (0.08 sq.m.) per kilowatt installed for the building.



FEED-WATER HEATING ARRANGEMENT AND METHOD OF MAINTAINING HEAT BALANCE

As may be seen from the sectional elevation of the plant, the boilers are set on the second floor. Below the central firing aisle are the train sheds for unloading coal and a storage pit having a capacity of 350 tons per boiler. On either side are the stoker ash hoppers, from which ashes are dumped directly into railway cars without intermediate handling. The forced-draft fans are on the boiler-room floor back of the respective boilers, and the induced-draft fans are at either side of the boiler house on a level with the economizers. They discharge upward into a smoke flue on the roof leading to a self-supporting steel stack placed centrally so as to serve four boilers on the same side of the firing aisle.

Originally it was planned to have four boilers per turbo-generator, but the seven boilers now installed have given such excellent results, operating up to 300 per cent of nominal rating without the least difficulty, that three boilers per generating unit of 30,000 kw. are now considered ample. Since each boiler contains 15,089 sq.ft. (1,388 sq.m.) of steam-making surface,

Calumet Station

of the

Commonwealth Edison Company

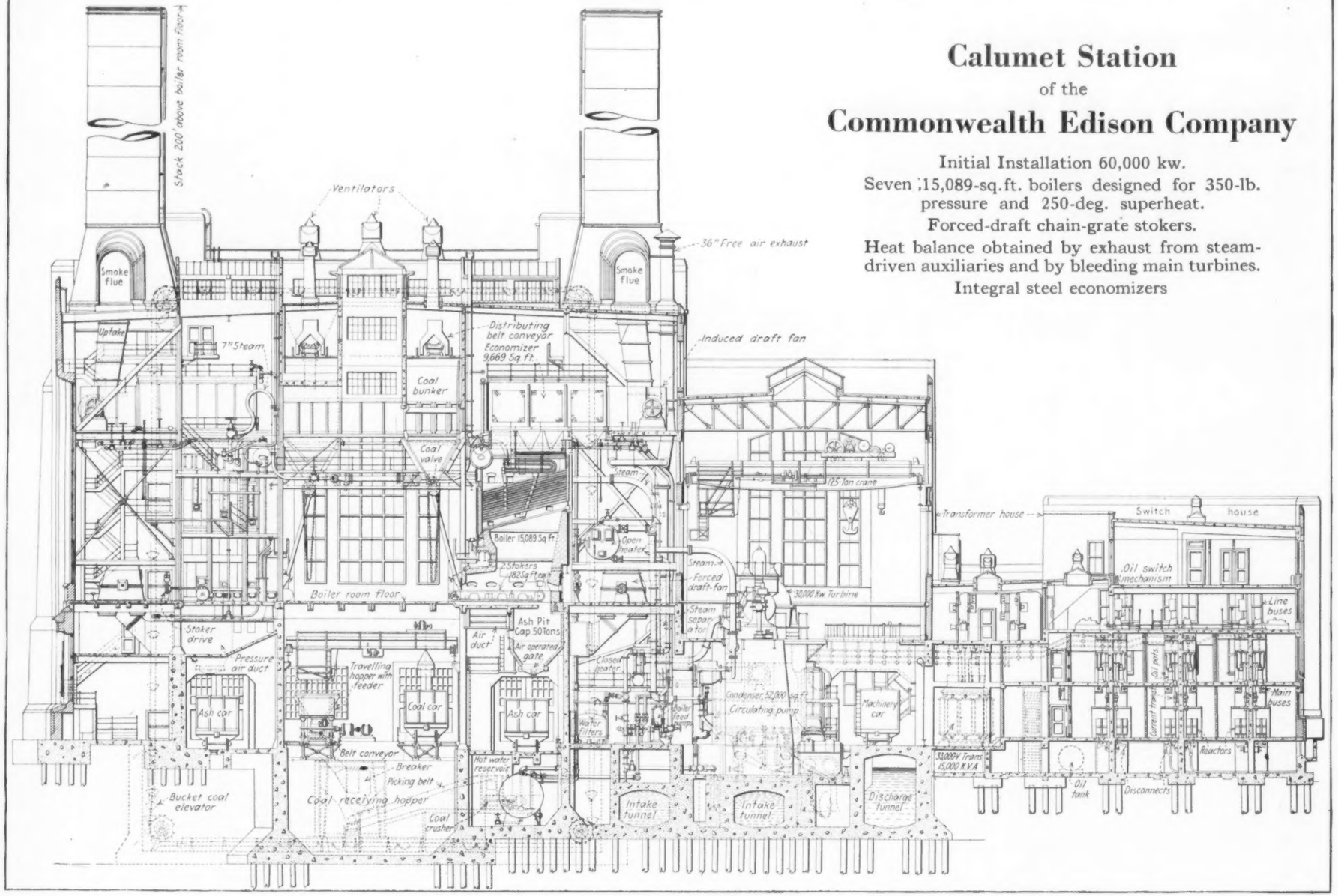
Initial Installation 60,000 kw.

Seven 15,089-sq.ft. boilers designed for 350-lb. pressure and 250-deg. superheat.

Forced-draft chain-grate stokers.

Heat balance obtained by exhaust from steam-driven auxiliaries and by bleeding main turbines.

Integral steel economizers



the allotment of three boilers to a generating unit would provide 1.5 sq.ft. (0.13 sq.m.) of heating surface per kilowatt of generator rating. Superheater surface and economizer surface are provided equivalent to 20 per cent and 64 per cent of the boiler heating surface respectively. The arrangement of the baffling, the location of the superheater and the division of the economizer into three sections, with the tubes running crosswise of the boiler tubes, are also clearly shown in the sectional elevation.

FORCED-DRAFT CHAIN GRATE HAVING 444 SQ.FT. OF AREA

Six of the boilers are served by forced-draft chain-grate stokers, two per boiler, set under the low end. Each stoker has an effective area of 182 sq.ft. (16.7 sq.m.), giving 364 sq.ft. (33.4 sq.m.) per boiler, which gives a ratio of one to forty-one to the steam-making surface. Under the seventh boiler of the present installation is a mammoth chain-grate stoker measuring 24 ft. 7.3 m.) in width by 18½ ft. (5.6 m.) in length and having 444 sq.ft. (40.8 sq.m.) of effective area, as compared with 364 sq.ft. (33.4 sq.m.) (aggregate) for the double stokers under the other boilers. Although the grate surface is continuous, the stoker is made of two separate chains, with the driving shafts coupled at the center and a motor at either side, the two being under common control. Approximately 7 per cent air space has been provided. To prevent clinker adherence, water boxes are placed on the ledge plates at the sides of the furnace and a 10-in. (25-cm.) waterback protects the rear wall. All three are connected into the boiler circulation. The stoker has six zones to which air is supplied by motor-driven fans.

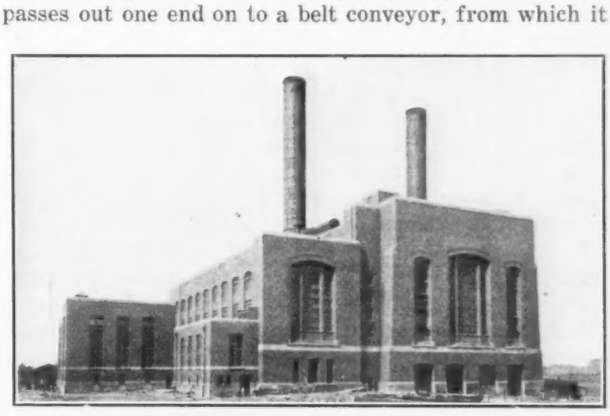
Air for combustion may be drawn from the boiler room or from the train shed immediately below, but the turbine-room basement will be the normal source of air supply. From a Y discharge on each multivane fan an air duct leads to each side of the stoker windbox. Admission to the air chamber of each zone is effected through sliding dampers controlled by levers at the side of the setting, their position determining the volume and pressure of air for each zone. Cross-connection between the inner ducts makes it possible for either fan to supply both stokers of the unit or to equalize the pressure between the two.

The absence of bridge walls and the use of waterbacks, ventilated side-wall tile and radial-end arches characterize the furnaces which are used. With the bottom of the front tube header 15⅓ ft. (4.6 m.) above the floor and the boiler tubes at the entrance to the first pass approximately 20 ft. (6 m.) above the grates, a furnace volume of 6,700 cu.ft. (189.7 cu.m.) is secured, giving 18.4 cu.ft. of volume per square foot (5.5 cu.m. per sq.m.) or grate area, or roughly 0.3 cu.ft. per pound of coal (0.017 cu.m. per kg.) burned at a combustion rate of 60 lb. per hour per square foot of grate surface (290 kg. per sq.m.).

Radial-end arches are used to protect the steel supports at the heel of the arch. The ignition arch extends 23 in. (58.4 cm.) into the furnace, allowing a gate opening of 20 in. (50 cm.). The main arch, which is 7 ft. (2.1 m.) long also has the radial or "fan"-end construction, which eliminates sharp corners and gives less opportunity for the hot gases to start disintegration of the arch. At the front of the furnace the main arch is 4 ft. (1.2 m.) above the grate, and in its length it has a rise of 6 in. (15 cm.).

Ashes are discharged from the rear end of the stokers into 50-ton hoppers placed directly underneath. These hoppers are protected against the action of the hot ashes and are provided with a sprinkler system for wetting them down before they are discharged through pneumatically operated gates into railway cars below.

Coal is unloaded in the train shed immediately under the central firing aisle of the boiler room by means of a traveling crane which discharges its load either into the large storage pit previously mentioned or into a traveling hopper. From the hopper the coal is fed on to a belt conveyor and delivered to a coal breaker similar to that used in the by-product coke industry. However, this is the first time that an installation of this kind has been made in a central station. The breaker has a capacity of 200 tons per hour. When the extension of the plant is made another breaker of equal capacity will be installed. Refuse, like tramp iron, mine props, etc., which is separated by the breaker, passes out one end on to a belt conveyor, from which it



60,000-KW. NOW INSTALLED IN CALUMET STATION

is picked off, allowing any good coal that may have been carried out of the breaker to pass on to another conveyor feeding two roll crushers. The latter discharges into a pivoted bucket conveyor carrying the coal to the top of the boiler house.

Coal passing through the breaker discharges into the traveling hoppers previously mentioned and is fed on to a short belt conveyor which is reversible and may be discharged onto either one of two pivoted bucket conveyors elevating the coal to the overhead bunker level. Only one of these pivoted buckets has been installed, but when the addition to the plant is made the other will be added. From the conveyor the coal passes into either one of two receiving hoppers which discharge directly on to belt conveyors running above the coal bunkers.

As previously stated, two generating units have been installed, each having a capacity of 30,000 kw. at 85 per cent power factor. Unit No. 1 is a tandem compound machine having a speed of 1,200 r.p.m., and unit No. 2 develops the entire capacity in a single casing, the speed being 1,800 r.p.m. The condensers have 1.73 sq.ft (0.161 sq.m.) of cooling surface per kilowatt of generator rating.

Unit No. 1 has two condensate pumps, one motor-driven, the other turbine-driven. The air pumps are of the hydraulic type. For unit No. 2 hydraulic air pumps are also employed. Four units are installed, although normally two will take care of the requirements. The installation includes hurling-water pumps

and a tank to store the water circulated through the air nozzles. The hurling-water pumps are mounted on the same shafts as the condensate pumps.

Circulating water for the condensers is taken from the Calumet River through four revolving screens backed up by a double set of stationary screens which will be replaced ultimately by traveling screens. From the crib house to the intake tunnels under the turbine-room basement the water is carried in an open flume. A common discharge tunnel carries the water to another open flume leading back to the river.

PRIME MOVERS BLED TO MAINTAIN FEED WATER TEMPERATURE

The feed-water heating system and the method of maintaining the heat balance are particularly interesting. Temperature of the feed water will be maintained about 175 deg. F. to prevent condensation of the sulphurous acid in the flue gases on the economizer tubes and thus reduce the external corrosion that would otherwise take place. Briefly, this is accomplished by introducing a closed heater between the condenser hotwell and the usual open feed-water heater. Sufficient steam is bled through the closed heater from the main turbines at about atmospheric pressure to maintain the water in the open heater at the temperature previouslv given. A recording thermometer guides the operator in varying the amount of steam bled from the turbines.

To heat the condensate, a certain amount of exhaust steam from auxiliaries as well as the discharge from steam traps is available. This is afforded by three turbine-driven boiler-feed pumps, one turbine-driven service pump and the steam-driven condenser auxiliaries. With the exception of the circulating pumps the condenser auxiliaries are in duplicate, one set being driven by turbines and the others by motors. As many of the auxiliaries as the heat balance will permit will be electrically operated.

An open heater to heat the feed water from 85 to 175 deg. F. is provided for each unit, the two being connected in parallel. The use of steam seals in turbine No. 1 made it desirable to recover the heat in this steam by passing it through an additional closed heater. The condensation from both closed heaters is returned to the hotwell of the condenser. The condensate pump draws from the hotwell of the condenser and forces the feed water through the closed heaters to the open feed-water heater. It then passes down to the feed pumps, which are cross-connected on the discharge side to give flexibility, and is forced up through the economizers to the boilers. Another path is through the auxiliary feed or wash line which bypasses the economizers and leads directly to the boilers. Feed-water regulators control the supply entering each boiler.

Makeup water is carried in a hot-water reservoir which receives the overflow from the open heater and the gland leakage. To maintain the level in this reservoir treated water is admitted under float control. An additional source of supply is the filtered-water system installed principally for gland cooling.

As the level drops in the open heater, a float opens a valve in the line from reservoir to the condenser hotwell and the vacuum draws over a supply of makeup water. If the level in the open heater should continue to fall, a second float at a lower level admits filtered water directly to the open heater.

In providing ventilation for the generators, a closed system has been employed, the cooling air being passed through a spray of water taken from the circulating-water tunnel. There is an alternate provision for carrying the hot air from the generators into the boiler room and drawing in fresh air through the air washer. In this event the water may be recirculated.

Oil strainers are installed at the main units, but no oil filters are employed. In the base of each unit sufficient storage has been provided for 1,000 gal. (3,780 l) of oil. This oil is pumped to the bearings and returned to storage in the usual way. To keep it at the proper temperature, the storage supply is constantly circulated through an oil cooler connected across the inlet and discharge of the condenser.

As much of the auxiliary apparatus in the station is motor-driven, elaborate provision has been made to insure the continuity of the electric supply. All auxiliary motors larger than 100 hp. are on 2,300-volt service, and those below 100 hp. are designed for 440 volts, with the exception of the stoker motors, which are 220-volt direct-current machines. To supply these services step-down transformers are connected to a special 12,000-volt bus placed in the transformer house.

For the 2,300-volt auxiliary service three buses have been provided—a 1,200-volt starting bus, a 2,300-volt running bus and a transfer bus, the last being an alternate to the running bus and supplied by an emergency transformer from the opposite section of the main auxiliary bus. The 2,300-volt auxiliary power center is located in the transformer house at the turbine-room floor level. All service switches for the large motors are installed in this location and arranged for remote control from the motors. Compensating starters are employed only on the 440-volt motors. When the starting push-button at the motor is closed, the motor is connected to the 1,200-volt starting bus fed from half taps on the transformer through a starting switch which remains closed until the starting current has dropped to a predetermined value, at which time an accelerating relay operates and opens this switch. Auxiliary contacts on the starting switch complete the closing circuit on the running switch after the starting switch is open, thus automatically throwing the motor over from the starting bus to the 2,300-volt running bus.

The design and construction of the steam plant was carried on under the general direction of Sargent & Lundy, consulting engineers, while the electrical installation was designed and installed by the engineering department of the Commonwealth Edison Company.

Public Service Company of Northern Illinois Ranks Twenty-seventh

THE Public Service Company of Northern Illinois reports an output of 415,940,095 kw.-hr. in 1921. This report, just received, indicates that the company should have been included in the tabulation of generating and distributing companies having an output of more than 100,000,000 kw.-hr. in 1921 which was published in the April 29 issue of the ELECTRICAL WORLD. This company would have ranked twenty-seventh in the tabulation. Of its total output, 359,410,664 kw.-hr. was generated in the company's plants and 56,529,431 kw.hr. was purchased. The peak load was 80,563 kw. and took place on Dec. 30, 1921.

Some Economic Phases of 40-Degree and 50-Degree Ratings

Two Ratings Have Increased Number of Frame Sizes and Confused the Buyer—50-Deg. Rating, to Be Justified, Must Afford Benefits Which Will Quickly Offset Cost of Introduction

By CLARENCE L. COLLENS, 2d
President Reliance Electric & Engineering Company, Cleveland

MANY articles and letters have appeared in the technical press during the past two years on the relative merits of 40-degree and 50-degree ratings, but these have dealt with the subject almost entirely from the engineering technical standpoint. This unfortunately has tended to becloud the real issue, which is very largely commercial and economic.

For years the 40-degree rating was the only recognized rating for many classes of electrical machinery. During this period there was no loud outcry of protest from any quarter against this rating, but, judging from the statements now made against the 40-degree rating, this period might properly be compared to the Dark Ages, in which the manufacturers and the consuming public were blindly groping in the dark and were with great difficulty and with costly errors endeavoring to use electrical machinery of uncertain and indefinite capacity. To bring order out of chaos and to satisfy a bewildered purchasing public, the 50-degree rating was finally offered as an "advance in the art."

Any claimed advance in the art in order to justify itself must possess some economic benefits to the consuming public. For purposes of illustration in discussing this situation from the economic standpoint, I will limit myself to industrial power motors in sizes of from 1-hp. to 50-hp. capacity, which is where the question of the relative advantages of the 40-degree or 50-degree rating has largely centered.

It is an acknowledged fact that with the same closeness of design the 50-degree ratings give frame sizes whose inherent capacities measured by the same yardstick are intermediate between the 40-degree frame sizes, or vice versa. Thus a 15-hp., 50-degree motor may be given approximately a 12.5-hp., 40-degree rating and be intermediate between a 10-hp. and a 15-hp., 40-degree rating. Similarly a 10-hp., 40-degree motor can be given a higher 50-degree rating which places it intermediate between a 10-hp. and a 15-hp., 50-degree rating. Reducing either one or the other to a common basis, we then have twice the number of frame sizes, or have, roughly, 1, 1.2, 1.5, 1.8, 2, 2.5, 3, 3.6, 5, 6, 7.5, 8.3, 10, 12.5, 15, etc., horsepower ratings instead of the previous standards of 1, 1.5, 2, 3, 5, 7.5, 10, 15 hp., etc. Many companies are building merely the 40-degree ratings, but the majority of companies building 50-degree ratings are also building the 40-degree ratings. These may either be distinct frame sizes or changes in winding specifications to give proper operating characteristics. I believe that this practice will be extended rather than curtailed, because the purchasing public is gradually being educated and there are ardent partisans in each camp. In fact, one company which replaced its 40-degree ratings with 50-degree ratings is now offering both as a distinct proposition instead of merely a de-rated 50-degree motor in cases where a 40-degree motor is called for. There can be no economic justification for the injection into an industry of twice the number of sizes previously found satisfactory, and it is diametrically opposed to the principles of simplification so admirably advocated by Secretary Hoover as an absolute necessity in the economic and industrial welfare of the nation. Some engineers rejoice in the dilemma in which the electrical apparatus industry now finds itself, as these engineers in buying have twice the number of frame sizes from which to select to meet various conditions of load.

The commercial confusion at the present time due to the two ratings is exactly the same as if two units of length both called a rod were commonly used in this country, one being the old standard of 5½ yards and the other being a new standard of 5½ meters. Whether it is measured with one or the other, the true length of some article offered to the public has not changed, but in making a purchase the buyer may not always know that a difference exists, or from lack of technical knowledge may be incapable of comprehending the significance of the difference even if told.

Economic and Engineering Considerations Cannot Be Separated

The economic consideration of the present two ratings cannot be divorced from application engineering. If all the operating conditions for which motors are to be selected were 5 hp., 7½ hp., 10 hp., etc., continuous, steady, fixed loads without any variation whatsoever, then there would in reality be no field for the application engineer, and 5-hp., 7.5 hp., 10-hp., etc., 50-degree motors could be applied to these operating conditions instead of 5-hp., 7.5-hp., 10-hp., etc., 40-degree ratings with a saving of from 5 to 7½ per cent in first cost, but with an acknowledged 10-degree less margin of safety in temperature to meet the many operating conditions which tend to increase temperature rise, such as clogging with dirt and dust, low voltage, etc. But all the operating conditions are not fixed, constant, steady loads corresponding in magnitude with arbitrarily chosen units of load rating standardized for the industry, namely, 5, 7.5, 10 hp., etc. There are just as many 5.3, 6.1, 6.5, 7-hp. loads and there are infinite variations in duty cycle, all of which must be taken into account by the application engineer in determining the motor to be selected.

Assuming one application engineer A offering a line of 40-degree ratings to meet all the operating conditions in the United States, and another application

engineer B offering a line of 50-degree ratings to meet those same conditions, I maintain that because one is offering intermediate frame sizes as compared with the other, the first cost of a complete 40-degree installation is no higher than the first cost of a complete 50-degree installation, because under the infallible law of averages there are just as many cases where the 40-degree man can effect a saving by using a smaller 40-degree frame size as where the 50-degree man can effect a similar saving by using a smaller 50-degree frame size. This assumes the same margin of safety for temperature in each case, which is the only basis on which the two can be economically compared. Naturally the purchasing public is willing to pay more for a greater margin of safety in temperature, although under the premises no matter what margin of safety is selected by the public the same conclusion would have been reached. Where, then, is the economic advantage to the purchasing public in the 50-degree ratings?

To say that an intelligent purchasing public neglects the difference in inherent capacity between a 10-hp., 40-degree motor and a 10-hp., 50-degree motor, and that a qualified application engineer ignores this difference in selecting a motor for a given load and duty cycle, is absolutely contrary to what a careful investigation of the facts would reveal. The economic advantage is often in favor of the 40-degree motor because there are many engineers who always select a 50-degree motor of the next larger regular horsepower rating for a given job as compared with the 40-degree rating; for example, they select a 10-hp., 50-degree motor where they are willing to use a 7.5-hp., 40-degree motor.

Should Not Play on Confusion of Buyers

There are, of course, some purchasers who know nothing about the difference in the methods of rating motors, know nothing about application engineering, and have no accurate knowledge of the load conditions and duty cycle for which the motor is being purchased. Such a purchaser is simply in the market for say a 7.5-hp. motor and finds that he is able to buy one 7.5-hp. motor for what to him is a price advantage as compared with another 7.5-hp. motor. To such a purchaser the vendors of the 50-degree rating appear in the position of giving a cut-price product as compared with the vendors of the 40-degree rating, for such a purchaser judges the two products as equal. An "advance in the art" which derives its economic benefits because of ignorance on the part of any of the purchasing public is on an exceedingly doubtful ground for its economic justification and enjoys merely a temporary advantage.

It is like the man who is in the market for bread and has no knowledge of the significance of the units of weight. He knows there are whole-sized loaves and half-sized loaves. All he wants is a half loaf of bread, and a half loaf marked 11 ounces has equal merit in his eyes with the half loaf marked 12 ounces. He buys the 11-ounce loaf at a lower price and goes on his way rejoicing. Unfortunately in many cases his hunger is satisfied by part of the half loaf purchased, the rest being thrown away, so that he never has an opportunity to learn by actual experience that the nutritive content, or inherent capacity, of the one is less than the other. The vendors of the 11-ounce loaf have an advantage without giving a real economic benefit.

Not only must an advance in the art give an economic benefit, but the economic benefit must be sufficient to absorb within a reasonable length of time all the cost of its introduction. It would cost the industry many millions of dollars to redesign completely all makes, types and sizes of electrical machinery from the 40-degree ratings to the 50-degree ratings. It is costing the industry other millions in the commercial confusion which results from a change of this character, the additional sales effort which is necessary to educate the purchasing public to the differences in the two standards, and in the inevitable and harmful price war which results where two standards are striving for supremacy in a highly competitive market. This is all in addition to the increased inventory cost and the additional manufacturing cost of manufacturing and offering, as is often done, both ratings, with the resulting division of a given volume of production into more individual varieties, sizes, etc. In the end the purchasing or investing public must pay this cost, but it presents a stupendous debit balance against "an advance in the art" of such doubtful economic value as the one under discussion.

If the change had been prompted by an advance in the quality or kind of insulating materials used, permitting higher temperature values with the *same factor of safety*, a real economic advantage could have been shown, but no such claims are presented. The result has simply been the introduction of intermediate frame sizes, which, if the customer applies the same factor of safety to each and reduces each to the same yardstick, gives under the law of averages no economic benefits where either the one or the other is used exclusively.

We all acknowledge that in the past there has been unnecessary overmotoring and little attention paid to application engineering. Had the same amount of time, money and effort been spent in educating the purchasing public and all sales organizations to a proper conception and more general use of the fundamental principles of application engineering and common sense in the choice of motors, even greater economic benefit could have been obtained without the resulting commercial demoralization which now exists. If the overload guarantee on the 40-degree rating confused the buying public and gave an "indefinite rating" with "only a general idea of its capacity," this could have been eliminated and a 40-degree single rating offered as a single standard without the tremendous development cost and attendant commercial confusion of the present two standards. As already explained, the 40-degree rating offers the same economic benefits where application engineering is properly applied.

No solution of the present exceedingly costly and uneconomical situation is as yet in sight, and the introduction of the 50-degree rating as an economic advance in the art has yet to be proved.

Energy Consumption by Various Types of Consumers

IT HAS been only within recent years that the complete adoption of metering devices has made it possible to make an intelligent investigation of the consumption of central-station energy by various types of consumers. Such an investigation has just been completed by A. C. Hall of the Southern Illinois Light & Power Company, covering the wide territory served by this company.

The accompanying table gives the average connected

load and average annual consumption of various kinds of commercial customers as shown by this survey. The large connected load and energy consumption of the motion-picture industry are probably the most striking figures in the tabulation, which, it will be noted, goes back far enough to take in saloons.

TABLE OF CONNECTED LOADS FOR VARIOUS TYPES OF SERVICE

Kind of Business	Average Active Consumers	Average Connected Load, Watts	Average Kw.-hr. Per Year Per Consumer
Saloons and poolrooms	23	1,128	1,318
Restaurants	5	437	1,516
Stores	80	1,397	999
Dentists	6	342	97
Livery and feed stables	8	513	406
Picture shows	4	4,641	7,335
Photograph galleries	3	1,262	348
Lodge rooms and halls	12	1,163	362
Printing shops	4	1,520	1,574
Hotels and rooming houses	6	1,692	2,117
Hotels and saloons combined	4	3,019	3,801
Offices and banks	40	766	402
Schools	3	1,663	219
Churches	13	3,810	413
Club rooms, halls and skating rinks	2	643	201
Blacksmith shops, machine shops and garages	11	1,056	419
Factories	2	2,150	901
Plumbers	1	150	64
Miscellaneous*	26	787	681

* Includes bakeries, greenhouses, tailor shops, post offices, barber shops, railroad depots, laundries, gymnasiums and hallway lights.

Power Projects on the Colorado River

APPLICATIONS have been filed with the Federal Power Commission covering twelve projects on the Colorado River. The accompanying map shows the location of the various projects. Preliminary permits have been issued for a large portion of these projects, and surveys and estimates are now being made under these preliminary permits. James B. Girand has recently submitted to the commission the results of the surveys under preliminary permit No. 121 for a development at the mouth of the Diamond Creek and has applied for a license. This is the only development on the Colorado River for which the preliminary work has been completed.

Utility Securities as Investments for Life Insurance Companies*

Honest and Prudent Management and Fair Treatment by the Public and by Regulating Officials Necessary to Confidence and Financial Support

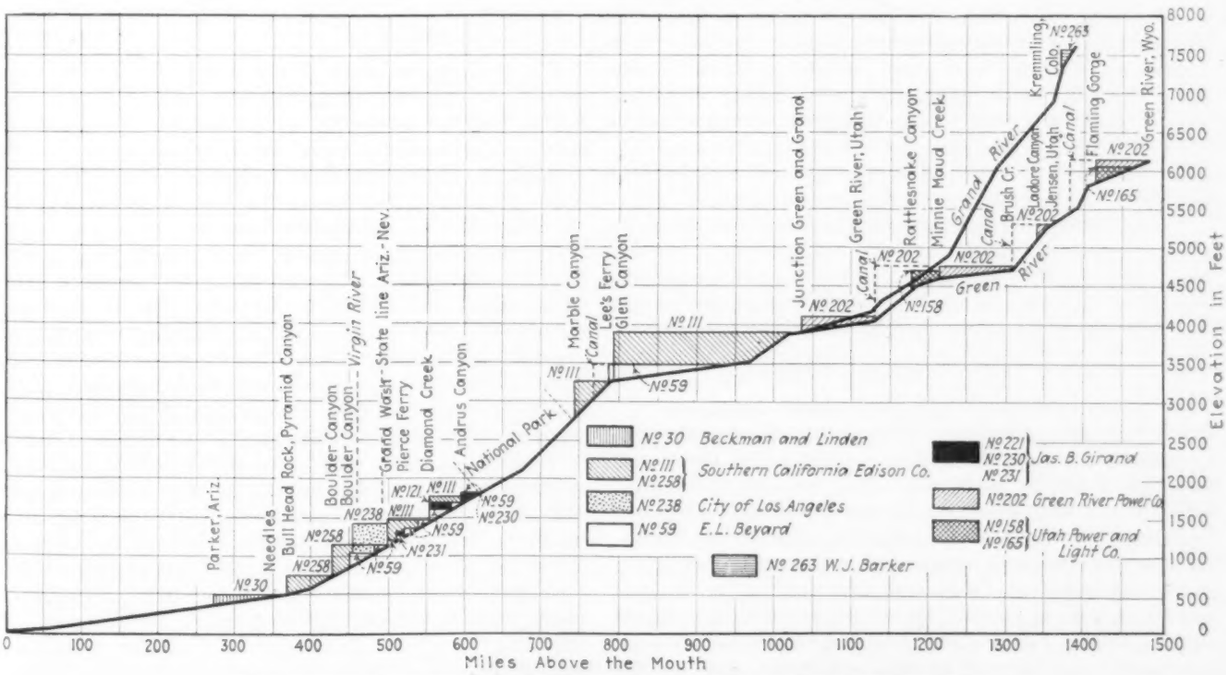
BY HALEY FISKE
President of the Metropolitan Life Insurance Company

I HAVE been asked to address you on the general subject of investment in light and power securities by life insurance companies. I can see the importance of the matter to your association, first because of your necessities, and second because of the enormous accumulation of life insurance assets amounting at the end of 1921 to eight and one-third billion dollars, and the large part of these assets invested in public utilities. Two years ago, that is at the end 1919, out of six billions of assets of American life insurance companies, about two billions were so invested.

As to your necessities, I am told that the total investments in light and power companies amount to five billion dollars and the financial division of my company, the Metropolitan Life, estimates that a billion dollars a year for the next five years will be required for refunding purposes, constructing generating stations, transmission lines, distribution systems, equipment, etc. This seems reasonable, for your present investments have doubled in the last ten years, and the business as years go on shows an accelerated growth. During the last seven years the companies have doubled the number of customers, and those years of course include the war years. Moreover, as the business develops, the uses of electricity are being multiplied and the localities covered are constantly extending.

No longer can it be said that electric light and power are restricted to city uses; the farming population is

*Speech delivered before National Electric Light Association at Atlantic City, May 17, 1922.



MAP SHOWING LOCATION OF WATER-POWER PROJECTS ON THE COLORADO RIVER

calling for modern conditions of living, and there are none more pervasive than the facilities afforded by electricity. Already the light and power companies reach two million farms, and as this fact becomes known and appreciated the demand among the non-provided is sure to increase. Thus this figure should be doubled within a few years.

INSURANCE COMPANIES SEEK SAFE INVESTMENT

Life insurance companies are constantly and eagerly looking for safe investments. Their assets must necessarily rapidly increase by reason of the principles on which the business is carried on. When I speak of life insurance companies, I am referring to the level-premium companies which build up reserves. The companies must invest the reserve at such a rate that the interest added to the reserves themselves and future premiums will produce the full amount of the insurance when it becomes due. The increase or reserves by life insurance companies in 1920 was $536,000,000. In 1921 my own company alone added $109,000,000 to reserves; I have not the figures for the other companies. You can therefore see how alert the executives must be to find good investment securities.

On what principles are those investments made? The first principle obviously is safety, for upon this depends solvency. Within this limit we may mention three other principles, though these are not all. One, very naturally, is to get the highest return, but this is modified by others, one of which concerns the needs of the general public and another the needs of the localities in which policy holders reside.

First, then, as to safety. This is a matter which *you* must control. The bondholder is interested primarily in having substantial equities back of the securities he buys, and insurance companies will not buy these bonds unless there are such equities. The obligation rests upon company management to maintain them; that is, there must be such a relation between values and mortgage bonds that the margin shall be kept ample. This margin should be at least 25 per cent. The Massachusetts law restricts the issuance of bonds to an amount not in excess of the paid-in capital. The companies must not rely upon borrowing on bonds and notes but must raise money by stock. Lately there has been a tendency in the wrong direction. From 1906-08 utility financing consisted of 76 per cent bonds and notes; in 1918-20 this percentage had increased to 88 per cent. It therefore devolves upon the management to make liberal provision for depreciation and keep up a high standard of maintenance. Unless this is done the credit of the companies is sure to become impaired. We have only to look at the traction situation to see the importance of these principles of management.

GOOD PUBLIC RELATIONS NEEDED

As public utilities, light and power companies are subject to public supervision and regulation, and these include rate fixing, there are therefore two directions in which investors must look. One is to the companies. Now, if you will allow me to say so, without any idea of boasting, I believe the great success of the Metropolitan Life Insurance Company, which in a generation has grown from one of the smallest to much the largest life insurance company in the world, is due to a constant policy of trying to sense and if possible forestall what the public has wanted on the one hand, and on the other giving loyal submission to the laws and endeavoring to keep in sympathetic touch with supervising authority to offer and even court full publicity in every detail of the business. It is your duty to satisfy the public as to service and charges. Self-interest requires the full performance of this duty. If your customers are satisfied, you have gone a long way toward business and corporate success. And full publicity of your operations and accounts is a necessary element in giving satisfaction. Extortion and inordinate profits must not be thought of. Fair returns must be insisted upon. Adequate facilities must be constantly offered. Your customers must always be made friends. Enlarge your opportunities to accomplish this. Get stock subscriptions from as many people as possible in the localities in which you operate. Encourage stock ownership among your employees. Convince them that they are fairly treated. Give them full information as to costs of plant, operation and maintenance.

On the other hand, investors have a right to fair treatment of your corporations by regulating authorities, and none has more right than life insurance companies. The Metropolitan Life Insurance Company has in force 26,000,000 policies, insuring 19,000,000 or 20,000,000 individual lives—one-sixth of the population. Thus it is not an abstract corporation that owns light and power securities amounting to $18,000,000. Our nearly a billion and a quarter of assets belong to them. This huge sum of money is their savings held for their protection. This is true not only of the mass but in separate localities. In ten of the largest cities of the country, with a combined population of 13,799,000, where we have light and power investments, our policy-holders number 4,612,982—or one-third of the population. The 251 life insurance companies doing business in the United States at the end of 1921 had 70,672,959 policies in force, insuring probably over fifty millions of individuals. They have the right of fair treatment on the part of supervising and regulating officials. When a light and power corporation is unfairly treated it is the people of the community, the voters and their dependents who suffer. It is their savings that are depleted.

DUTY OF UTILITIES, PUBLIC AND REGULATING BODIES

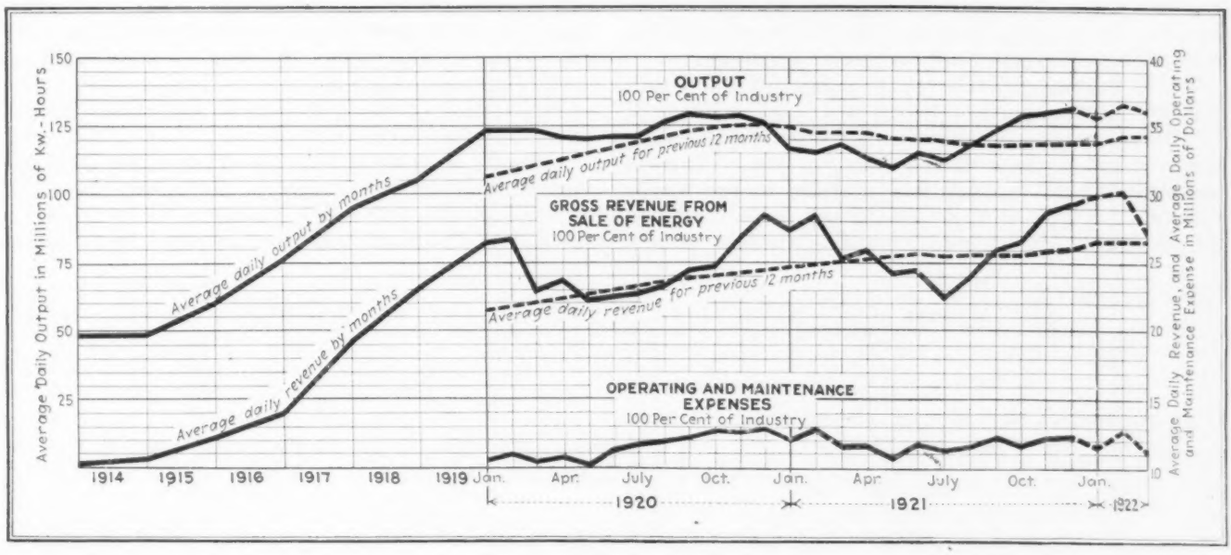
There must be public recognition of the tremendous part life insurance companies have played in the development of the country. Life insurance companies do not speculate. They make investments to keep. There can be no doubt that light and power distribution is a most important element in our life, in community life, in household life, in neighborhood life. In following out our principles of investment there should be a promising future for capital investments in light and power companies. I am here to advocate that these investments shall be studied by the management of life insurance companies, for a great service to community life can be rendered by furnishing needed capital on the principles and practices I have described. This gives me the right to say two things:

1. We have the right to insist upon honest, wise, prudent administration on the part of the companies; that there shall be no exploitation of population or investors; that ample equities shall always be continued by attention to depreciation and maintenance; that customers shall be fairly and generously treated; that there shall be offered full co-operation with regulating officials in right treatment of communities and customers.

2. We have a right to insist upon fair treatment of

light and power companies by the public and by supervising officials. It must be recognized that not corporate abstractions but the American people are the owners of the bond capital of the companies. Every policy holder is *ipso facto* a capitalist. An attack upon capital investments is an attack upon the wage earners of the country. Not only the regulating authorities but the people themselves must be taught this. The policy holders need this fact to be brought home to them. It is important to teach the working people that *they* are the capitalists and that attack on capital investments is an attack upon themselves. Overtaxation, confiscation, failure to help public utilities by refusing to permit adequate rates, are robbing *them*, not the rich. It is the working people who suffer first when there is lack of the service afforded by public utility corporations, because it is they who are chiefly dependent upon such service. It is important that legislators and members of public commissions should realize these elemental facts. And they should remember that injustice done or permitted by them is injustice not to the wealthy, but to their own constituents who put them in office. It is not the rich who own the steam railroads, the trolley lines, the telephones, the light and power companies; it is the poor and the people of moderate means, whose savings are invested in these enterprises.

Output More than Four Billion Kilowatt-Hours During March



REPORTS received by the ELECTRICAL WORLD for the month of March indicate that for the second time in the history of the electric light and power industry the monthly output of electrical energy exceeded four billion kilowatt-hours. From all reports the industrial energy requirements increased during March, but a large decrease in the lighting load brought the average daily output below the record reported in February and the total output for the month slightly below the record figures reported in December of last year. These statements are based on reports received from generating and distributing companies representing 78 per cent of the installed rating of the industry. A large decrease in the high-revenue load was reflected in the drop in the average daily gross revenue, which was about 10.1 per cent below that reported for February. It must be noted, however, that the output reported for March is 13.6 per cent in excess of that reported for March of last year and that this is the largest yearly increase since September, 1920.

Economically also the March returns are most encouraging to the electric light and power industry, especially when this industry is compared with other primary industries of the country. The electric light and power industry, while reporting a gross revenue 9.2 per cent in excess of that reported in March, 1921, also reported operating and maintenance expenses during March 3.9 per cent below those of March, 1921. Very few industries can report a large increase in revenue and for the same period a material decrease in operating expenses.

The output of electrical energy during March reflected a pronounced increase in industrial activity throughout the country. This was particularly noticeable in the metal-working industries and in the iron and steel industry.

Strikes in a large number of the New England textile mills during March resulted in considerable curtailment of energy requirements in that industry. In Massachusetts, for instance, almost one-third of the energy sold by central-station companies to industrial customers is consumed by the textile mills. A considerable curtailment, therefore, in textile-mill operations is keenly felt by central stations of that state and section. Practically all the other primary industries in this section, however, called for additional energy during March, with the result that, in spite of materially decreased lighting requirements, the electric light and power com-

TABLE I—CENTRAL STATION RETURNS FOR TWENTY-FOUR MONTHS

	Percentage of Installed Ratings Represented	Kw.-Hr. Output (Companies Reporting) 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Revenue from the Sale of Energy (Companies Reporting) 1921 Thousands	1920 Thousands	Per Cent Increase		Percentage of Installed Ratings Represented	Operating and Maintenance Expenses (Companies reporting) 1921 Thousands of Dollars	1920 Thousands of Dollars	Per Cent Increase	OPERATING RATIO Steam Plants 1921	1920	Hydro Plants 1921	1920	Combined Systems of Steam and Hydro 1921	1920
April	77	2,675,549	2,895,067	−7.0	72	$55,326	$49,064	12.8	April	52	17,815	16,641	7.1	53.0	56.5	23.9	19.8	41.4	43.3
May	77	2,668,457	2,889,174	−7.6	72	53,901	47,932	12.6	May	52	17,274	16,727	3.1	55.4	56.8	24.2	22.9	40.6	44.8
June	77	2,686,479	2,872,900	−6.4	70	52,385	47,977	9.3	June	53	18,836	19,089	−1.3	56.2	62.5	20.4	21.6	45.0	50.9
July	77	2,706,016	2,949,132	−8.2	70	50,747	49,195	3.4	July	52	18,633	20,964	−11.1	56.8	65.9	20.6	20.2	43.0	52.6
Aug.	77	2,830,408	3,041,927	−6.7	70	51,931	50,848	2.1	Aug.	53	19,301	20,900	−7.6	56.2	63.8	22.3	22.2	44.5	52.3
Sept.	77	2,848,212	2,937,339	−3.0	70	54,501	52,955	2.9	Sept.	53	19,765	21,359	−7.5	54.1	60.3	20.8	22.1	47.3	54.7
Oct.	76	2,997,133	3,045,696	−1.5	71	57,340	55,599	3.1	Oct.	54	19,828	22,231	−10.8	51.6	60.8	21.3	20.9	45.6	50.8
Nov.	77	3,006,349	2,969,175	1.3	71	61,059	58,381	4.6	Nov.	55	19,692	21,773	−9.0	49.9	58.9	23.1	23.3	43.4	50.5
Dec.	77	3,124,073	3,024,374	3.3	71	64,088	61,420	4.4	Dec.	55	21,065	22,347	−5.7	47.8	55.9	26.9	29.3	46.1	49.2
		1922	1921			1922	1921				1922	1921		1922	1921	1922	1921	1922	1921
Jan.	78	3,102,046	2,843,179	9.1	71	65,666	61,364	7.0	Jan.	55	20,069	20,387	−1.6	45.7	52.7	23.0	23.9	41.2	42.3
Feb.	77	2,857,692	2,556,563	11.7	72	61,027	57,163	6.8	Feb.	54	18,984	19,330	−1.8	46.1	51.7	26.6	27.1	41.2	42.3
Mar.	78	3,142,317	2,766,503	13.6	72	60,675	55,538	9.2	Mar.	55	18,959	19,728	−3.9	48.3	54.6	27.1	21.0	40.7	42.8

panies of the New England States distributed daily more energy during March than during February, a condition which did not exist in any other section.

In the North Atlantic States increased activities were reported in the iron and steel industry, which was operating at about 70 per cent capacity; in the metals industry and in the railroad repair shops. All industries dependent upon building activities were unusually busy, with an increased call for electrical energy.

While activity in the textile mills of the South Atlantic States during March was below that of February, almost one million more cotton spindles were being operated than during March, 1921. This is directly contrary to conditions existing in the textile mills of the Northern States, where more than one million fewer spindles were operating than in March, 1921. Very few industries in this section reported operations under those of February.

Taking the Atlantic section as a whole, therefore, it appears that in the aggregate industrial energy requirements were slightly increased over those of February. The advancing season, however, served materially to lessen the lighting load of virtually all distributing companies in spite of new customers having been added during the month. The net result of these opposing tendencies was a decrease in the average daily output of this section of about 750,000 kw.-hr. under that reported for February.

A steady increase in the operation of the iron and steel mills in the North Central States and the record activity of the automobile industry of that section called for additional electrical energy from central

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWENTY-FOUR-MONTH PERIOD

	Month	Percentage of Installed Ratings Represented	New England States 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Atlantic States 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	North Central States 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	South Central States 1921 Thousands	1920 Thousands	Per Cent Increase	Percentage of Installed Ratings Represented	Pacific and Mountain States 1921 Thousands	1920 Thousands	Per Cent Increase
KW.-HR. OUTPUT	April..	80	196,680	227,008	-13.3	79	963,659	1,052,716	−8.4	71	828,457	894,028	−7.3	59	132,075	135,421	−2.5	89	555,048	586,894	−5.4
	May..	81	191,141	219,298	-12.8	78	934,973	989,408	−5.5	71	819,506	899,657	−8.9	59	136,573	138,416	−1.3	91	586,264	642,495	−8.7
	June..	80	192,007	219,476	-12.5	78	940,443	1,003,727	−6.3	71	806,270	880,934	−8.5	60	136,011	129,120	5.3	92	611,128	639,637	−4.5
	July...	80	187,622	218,995	-14.3	77	934,822	1,026,390	−8.9	71	804,009	884,572	−9.1	60	140,795	141,450	−0.6	92	639,768	678,725	−5.7
	Aug...	79	205,351	224,324	−8.5	78	992,681	1,054,124	−5.8	71	848,803	923,210	−8.1	60	147,967	154,353	−4.1	93	644,696	685,916	−6.1
	Sept...	79	221,364	223,269	−0.8	78	1,004,252	1,051,268	−4.5	71	851,671	886,370	−3.9	60	149,758	151,680	−1.2	93	621,167	624,752	−0.5
	Oct....	79	249,202	221,929	12.1	78	1,103,525	1,121,676	−1.6	71	919,514	930,236	−1.1	60	154,266	156,713	−1.5	94	570,626	615,142	−7.2
	Nov....	79	247,119	215,565	14.6	77	1,128,453	1,112,914	1.4	71	913,142	908,121	0.5	60	154,125	150,976	2.0	94	563,510	580,124	−3.1
	Dec....	79	253,206	216,717	16.8	78	1,196,724	1,150,695	4.0	71	948,909	925,346	2.2	61	153,549	150,920	1.7	93	571,685	580,696	−1.6
			1922	1921			1922	1921			1922	1921			1922	1921			1922	1921	
	Jan....	81	253,009	203,937	24.2	81	1,181,850	1,071,876	10.2	71	946,181	859,193	10.1	60	156,540	141,937	10.3	93	564,466	566,236	−0.3
	Feb....	82	232,008	184,854	25.6	81	1,077,350	956,896	12.1	68	859,852	776,106	10.8	60	143,040	131,970	8.4	93	545,442	506,737	7.7
	March	82	258,047	210,142	22.8	81	1,174,039	1,020,604	15.0	70	961,333	853,158	12.7	60	153,793	142,004	8.3	94	595,105	540,595	10.1
REVENUE			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	April..	80	$5,665	$5,554	2.0	72	$21,504	$18,609	15.8	58	$15,506	$13,822	12.2	58	$3,744	$3,312	13.2	89	$8,817	$7,767	13.6
	May..	81	5,362	5,342	0.4	72	20,795	17,613	18.0	58	14,866	13,558	9.8	59	3,516	3,179	10.7	91	9,362	8,240	13.7
	June..	80	5,285	5,397	−2.4	72	20,058	17,438	15.0	58	14,485	13,519	7.1	59	3,536	3,152	12.2	92	9,021	8,439	6.9
	July....	80	5,180	5,121	1.1	72	18,798	17,155	9.2	58	14,158	14,689	−3.6	60	3,509	3,145	11.3	92	9,101	8,733	4.3
	Aug....	79	5,297	5,483	−3.3	72	19,050	17,926	6.2	58	14,465	14,594	−0.8	60	3,612	3,536	2.2	93	9,507	9,309	2.1
	Sept....	79	5,694	5,857	−2.7	72	19,992	18,750	6.6	58	15,324	15,192	0.8	59	3,811	3,673	3.7	93	9,680	9,482	2.0
	Oct....	79	6,332	6,072	4.2	71	21,520	20,115	6.9	58	16,098	16,175	−0.4	60	3,920	3,903	0.4	94	9,470	9,334	1.4
	Nov....	79	6,806	6,238	9.1	71	23,282	21,541	8.1	58	17,123	16,954	0.9	60	4,139	4,158	−0.4	94	9,745	9,489	2.7
	Dec....	79	6,987	6,573	6.3	72	25,168	23,519	7.0	58	17,748	17,535	1.2	61	4,234	4,149	2.0	93	9,942	9,644	3.1
			1922	1921			1922	1921			1922	1921			1922	1921			1922	1921	
	Jan....	81	7,202	6,581	9.5	75	25,986	23,859	8.9	58	17,822	16,745	6.5	60	4,366	4,222	3.4	93	10,224	9,912	3.2
	Feb....	82	6,771	6,165	9.8	75	23,802	22,011	8.2	55	16,838	16,054	4.9	60	4,090	3,970	3.0	93	9,526	8,963	6.3
	March	82	6,363	5,947	7.0	75	23,914	21,545	11.0	57	16,879	15,556	8.5	60	4,050	3,797	6.7	94	9,469	8,693	8.9
OPERATING EXPENSES:			1921	1920			1921	1920			1921	1920			1921	1920			1921	1920	
	April....	44	$1,418	$1,479	−4.1	56	$7,590	$7,168	5.9	34	$4,347	$4,112	5.7	48	$1,567	$1,403	11.6	80	$2,893	$2,479	16.8
	May....	48	1,548	1,577	−1.8	53	6,921	6,660	4.0	36	4,274	4,292	−0.4	49	1,563	1,486	5.2	83	2,969	2,713	9.5
	June....	45	1,737	1,862	−6.7	53	6,916	6,878	0.5	38	4,843	5,152	−5.9	56	1,835	1,678	9.4	86	3,565	3,519	1.3
	July....	46	1,712	2,077	-17.6	50	6,772	7,111	−4.8	37	4,940	5,800	-14.8	58	1,870	2,039	−8.2	86	3,339	3,937	-15.1
	Aug....	47	1,861	2,088	-10.8	50	6,871	7,131	−3.6	37	5,028	5,793	-13.2	58	1,892	2,003	−5.5	92	3,648	3,884	−6.0
	Sept....	47	2,049	2,262	−9.4	51	6,851	7,294	−6.0	38	5,353	5,687	−5.8	59	1,949	2,184	-10.7	92	3,563	4,032	-11.6
	Oct....	47	2,141	2,095	2.1	54	7,175	7,927	−9.5	37	5,011	6,126	-18.2	59	1,990	2,192	−9.2	93	3,511	3,891	−9.7
	Nov....	49	2,040	1,964	3.8	54	7,103	7,790	−8.8	38	4,992	5,972	-16.4	59	1,931	2,262	-14.6	92	3,626	3,785	−4.2
	Dec....	50	2,075	1,901	9.1	54	7,993	8,378	−4.6	37	5,216	6,205	-15.9	59	1,968	2,161	−8.9	92	3,814	3,705	2.9
			1922	1921			1922	1921			1922	1921			1922	1921			1922	1921	
	Jan....	51	2,038	1,802	13.1	55	7,386	7,391	−0.0	37	5,049	5,675	-11.0	59	2,007	2,153	−6.8	92	3,589	3,366	6.6
	Feb....	52	1,944	1,639	18.6	55	7,020	7,179	−2.2	36	4,772	5,196	−8.2	59	1,887	2,066	−8.7	92	3,361	3,250	3.4
	March....	53	1,798	1,741	3.2	56	7,096	7,352	−3.5	38	4,818	5,201	−7.4	59	1,954	2,108	−7.3	93	3,293	3,326	−1.0

TABLE III—AGGREGATE OPERATING RATIO OF COMPANIES REPORTING DATA MONTHLY TO THE "ELECTRICAL WORLD"

Type of Generating Plant and Month	New England States				Atlantic States				North Central States				South Central States				Mountain and Pacific States			
			Average for Previous 12 Months				Average for Previous 12 Months				Average for Previous 12 Months				Average for Previous 12 Months				Average for Previous 12 Months	
	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920	1921	1920
Steam Plants:																				
April	59.4	63.5	57.3	62.7	50.9	54.3	52.8	53.8	54.8	61.2	59.3	60.2	54.1	52.8	54.7	52.1	53.7	53.7	61.8	58.6
May	63.2	69.1	58.3	63.8	56.2	58.6	53.4	54.5	54.7	63.3	58.5	60.8	53.3	56.0	54.4	53.0	55.0	57.0	59.9	58.3
June	60.1	71.2	58.7	64.9	55.8	59.5	53.8	55.3	56.6	68.3	68.3	61.8	55.3	60.0	54.6	53.8	53.4	56.2	58.6	57.8
July	60.7	77.3	59.0	66.7	57.2	62.7	54.1	56.1	56.9	70.6	58.1	63.0	55.1	62.4	54.7	55.3	53.3	59.3	57.8	58.0
August	67.3	72.3	60.1	67.3	55.8	61.3	54.2	56.6	56.0	70.0	57.8	63.9	53.3	57.3	54.3	55.7	51.8	59.8	57.0	58.3
September	57.7	71.2	59.8	68.1	52.7	59.4	54.1	56.8	56.9	60.3	57.8	63.6	52.9	60.3	54.2	56.1	46.2	55.7	55.8	57.9
October	57.5	68.5	59.6	67.9	51.3	60.9	53.8	57.3	57.1	63.5	57.0	63.4	51.8	59.2	54.0	56.4	47.8	57.5	54.7	58.0
November	55.5	68.9	59.1	68.0	49.0	59.3	53.3	57.5	56.1	58.8	57.0	63.2	45.8	54.3	53.3	56.2	44.9	52.7	53.8	57.4
December	57.0	62.8	58.8	67.5	46.2	53.1	52.8	57.0	49.3	62.3	56.5	63.1	46.0	55.1	52.6	56.2	40.8	48.5	52.8	56.0
	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921
January	48.8	57.7	58.3	67.5	46.2	52.4	52.2	57.2	45.3	55.5	55.3	62.7	41.8	45.6	51.6	55.4	47.5	47.8	51.8	56.4
February	58.6	54.8	58.7	66.9	44.1	48.9	51.6	57.1	45.9	55.8	53.9	62.5	45.8	54.6	50.7	55.7	43.7	48.0	50.5	55.3
March	54.6	62.1	58.9	66.6	48.0	52.0	50.9	56.8	47.8	57.5	52.8	62.4	47.2	52.7	50.3	55.8	47.3	56.3	49.0	55.0
Hydro Plants:																				
April	24.6	34.7	26.5	35.2	18.2	18.8	20.2	20.3	24.8	20.8	24.2	20.7	22.4	25.0	26.8	21.2	27.3	19.2	26.0	24.2
May	26.5	25.6	26.5	34.3	15.5	17.4	19.2	19.7	21.5	20.1	22.5	20.5	27.9	21.2	27.1	21.2	29.8	22.9	26.6	24.0
June	29.2	21.5	26.6	33.8	17.6	18.8	19.0	19.6	21.1	19.5	22.8	20.2	27.3	18.3	27.1	20.7	30.3	27.4	27.6	24.2
July	29.2	29.6	26.6	33.9	15.9	21.1	18.6	19.8	19.4	19.7	22.3	20.2	27.3	18.3	27.7	20.7	24.2	19.9	26.3	23.7
August	31.4	36.5	26.8	33.9	16.7	20.9	18.3	19.8	20.7	21.6	22.0	20.4	33.7	23.1	28.5	21.0	25.1	24.3	26.2	23.6
September	31.4	32.2	26.8	33.4	16.0	19.9	18.1	19.9	20.8	21.1	21.9	28.7	27.6	20.2	28.4	20.9	23.4	22.8	25.9	23.6
October	32.0	32.0	26.8	33.4	17.8	22.9	18.1	20.2	20.3	18.1	21.6	20.2	30.0	21.0	28.4	20.9	26.4	23.6	25.9	23.6
November	31.0	31.4	26.8	33.4	16.4	22.1	17.9	20.5	20.9	19.2	21.6	20.1	33.7	26.3	29.0	21.5	25.6	24.6	25.8	23.7
December	30.8	34.3	29.2	33.4	23.4	29.9	18.4	21.8	16.5	27.2	21.3	27.5	33.8	28.3	28.9	21.5	27.9	29.1	26.2	24.6
	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921
January	25.0	19.3	30.0	49.7	16.7	21.4	18.0	21.8	28.9	25.6	22.0	21.1	33.8	28.3	29.2	22.2	26.6	25.9	26.1	24.3
February	29.7	32.8	30.0	47.9	17.2	20.8	17.8	20.8	26.7	23.8	22.4	21.4	37.4	37.7	35.2	33.8	37.8	36.5	26.7	24.2
March	36.3	34.1	31.3	45.0	23.9	27.8	18.2	22.4	26.0	25.6	22.7	21.8	37.0	37.3	35.6	34.2	28.6	36.0	27.0	25.5
Combined Systems of Steam and Hydro Plants:																				
April	46.6	48.5	47.1	53.5	42.9	43.9	41.9	44.8	45.0	48.3	42.7	47.5	43.6	48.6	40.7	42.8	37.0	36.8	37.0	41.0
May	49.2	48.5	47.6	52.3	39.8	44.2	41.4	44.7	47.0	52.8	43.7	48.8	40.7	39.6	40.6	42.2	35.0	38.3	36.4	40.3
June	58.5	56.5	49.6	53.2	42.3	45.8	41.6	44.9	50.1	62.2	45.0	51.6	45.1	44.8	41.3	42.7	38.8	44.3	37.0	41.1
July	56.1	63.2	50.5	54.7	42.6	51.3	41.7	45.8	51.6	64.4	46.0	53.9	53.6	45.3	41.4	42.8	35.4	43.1	36.8	41.5
August	60.6	62.7	51.9	55.8	46.5	49.0	42.3	46.2	51.2	64.5	46.6	55.5	45.3	50.0	41.9	43.8	36.8	43.5	36.7	41.8
September	62.9	65.5	53.4	57.3	47.4	50.6	42.9	46.7	51.2	62.6	46.9	56.3	45.0	47.3	42.2	44.2	38.3	47.7	36.9	42.5
October	59.3	67.9	54.2	57.4	47.5	47.8	43.4	46.8	47.3	60.5	47.3	56.9	46.3	52.5	42.7	45.3	37.4	42.7	37.0	42.5
November	51.6	51.6	53.9	56.7	42.9	51.6	43.3	47.5	42.3	57.0	47.2	57.0	48.3	51.3	43.3	45.9	41.9	44.6	37.3	42.8
December	52.4	43.8	53.8	55.8	44.3	53.4	43.4	48.1	43.6	57.6	46.9	57.0	48.0	44.3	43.8	45.8	47.0	43.1	37.9	42.8
	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921	1922	1921
January	48.7	43.1	53.4	54.6	39.9	44.7	43.0	47.8	38.8	43.9	46.2	56.1	40.1	38.6	43.8	45.2	33.5	32.2	38.0	42.3
February	45.3	46.5	53.2	53.3	46.5	50.0	43.6	48.4	44.7	46.6	46.4	55.8	38.6	43.0	43.7	45.7	34.6	34.7	37.7	41.5
March	46.7	46.0	52.8	52.7	49.3	52.4	44.5	49.0	43.3	49.3	46.7	55.8	41.6	38.4	43.8	45.4	32.6	34.1	37.2	40.8

stations during March. Conditions in the zinc and lead industries improved materially during the month, and coal mining reached the highest point of activity in several months. These improved industrial conditions and new lighting and industrial customers added during the month, while calling for more central-station energy, were more than offset by a materially decreased lighting load. The average daily energy output during March was 44,300,000 kw.-hr., as against 45,160,000 hours during February.

In the South Central States 70 per cent of the textile mills were running on full time, 25 per cent on part time and 5 per cent were shut down. The lumber industry was operating about on a par with February, and most of the other primary industries were operating slightly above February. The advancing season served to decrease the lighting load, and the resultant energy output of all the central stations of this section was slightly below that reported for February.

Material improvement was reported from the mining districts of the Mountain States, particularly in the copper industry. For the entire Mountain section it is estimated that employment increased about 15 per cent over February, largely owing to increased agricultural activity. In the Pacific States the lumber industry continued active, but most other industries were operating materially below normal. Taking the Mountain-Pacific section as a whole, the industrial energy required was probably slightly above that during February, and a number of new customers were undoubtedly added to the lines during the month. But the decreased lighting requirements here again resulted in a total energy output for the central stations below that of February.

It is encouraging to note that in the Mountain-Pacific Section especially the yearly percentage gain in gross revenue is rapidly increasing and that at the same time the operating expenses are decreasing. Probably no other industry of the West can make such economic claims.

Safety Standards for Mine Telephones

THE ordinary, innocent-appearing telephones used in the underground depths of coal mines are, according to an investigation just conducted by the United States Bureau of Mines at its experiment station at Pittsburgh, capable of igniting gas and thus bringing about disastrous mine explosions. The danger of gas ignition and explosion does not exist in the employment of such current as is necessary for talking over telephones, but results from the ringing of the magneto.

Actual tests on an ordinary mine telephone were made in a large testing gallery of approximately 400 cu.ft. capacity used by the Bureau of Mines for investigation of all types of electrical equipment in gaseous atmospheres. Tests were made by ringing the telephone inside the gallery when filled with gas but not connected to the external circuit; by ringing the inside telephone when connected to the external circuit, and by ringing the outside telephone while the receiver circuit of the inside telephone was being opened and closed. As the results of several series of trials made under varying conditions numerous ignitions and explosions of the gas in the gallery were obtained.

The results of the investigation indicate that the ordinary type of mine telephone, while designed to have a certain measure of dust and moisture tightness, is not an explosion-proof device and is, therefore, not safe in gaseous atmospheres. The Bureau of Mines stresses the need of the establishment of safety standards for mine telephones required to operate in such atmospheres.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

40-Degree and 50-Degree Motor Ratings

Contends that a 40-Degree Rating Expresses Definite Limitation

To the Editors of the ELECTRICAL WORLD:

In an editorial in the March 18 issue of the ELECTRICAL WORLD, entitled "A Machine Rating Should Express a Definite Limitation," we note your statement that "It is not to be wondered at that the conception of a single rating of electric generators and motors has found many manufacturers and users strongly opposed to this modification, as most advances in electrical design and construction which have been made by the slow process of standardization have encountered considerable opposition." Is this opposition really to the 50-degree single-rated machine, or to an attempt to substitute this single rating for the older rating of the 40-degree machine with an overload capacity?

The writer is in perfect accord with the title of your editorial—"A Machine Rating Should Express a Definite Limitation." However, your editorial conveyed the impression to me that this is the case only with 50-degree single-rated machines, which is not correct. A 40-degree machine is defined as one which will deliver its rated capacity at a rise in temperature not to exceed 40 degrees above the surrounding atmosphere, and which will carry an overload of 25 per cent for two hours at a temperature rise not to exceed 55 degrees above the surrounding atmosphere. This definition of a 40-degree rating expresses a very definite limitation. It very definitely defines the limit of temperature rise for a continuous load at the name-plate rating; it also definitely defines the limit of temperature rise at a definite load for a definite short-time rating.

I do not believe the designing engineer or the application engineer of today wants the latitude of 100 per cent error you have referred to. But there is a very definite demand and a very definite need for a motor with a combination of continuous-duty rating plus a short-time rating. This demand comes from the practical engineers and the men who have to use the motors and are responsible for their maintenance and for the production from these motors. Forty-degree motors can be applied as intelligently as 50-degree motors, without so great a limitation.

The real reasonable limit of capacity of a 40-degree rated machine is stated as definitely as is that of the 50-degree machine, and the application engineer can make his allowance for factor of safety as well in one case as in the other; only, as asserted above, in the case of the 40-degree machine he has a real definitely stated short-time rating which he can use, in addition to the continuous name-plate rating, and it does not mean that the engineer's allowance will be added to the manufacturers' allowance, "thus piling one margin of safety on another."

If desired to operate at a point of slightly lower efficiency, as in the case of the 50-degree motor, 40-degree motors can be loaded to a point where they will have a 50-degree temperature rise. The additional load will be about 20 per cent, and a 40-degree motor operated in this manner at 20 per cent overload will be just as satisfactory as a 50-degree motor. The application of motors is not an exact science. The field of application is too varied. In many applications the duty cycle is such that the motor needs a small excess capacity for a short duration of time.

It is true, as you state, that the Electric Power Club has indorsed the 50-degree rating without overload capacity; however, it is only fair to say that the Electric Power Club has also indorsed the 40-degree rating with an overload capacity. The club has also indorsed many other standards of temperature ratings for various purposes. The 40-degree motor has a very definite purpose and a very definite demand. We have learned of its uses and applications through years of experience. The Electric Power Club undoubtedly felt the need of another rating, and the 50-degree motor without overload capacity was added to its other standards. The 50 and 40-degree ratings as they stand today are two distinct ratings and should not be confused.

It is true as you have stated that a foot rule is meant to measure lengths within one foot and is not intended to be stretched. However, the rating of an electric machine and the standard of length are hardly comparable. If one were purchasing a piece of rubber by the standard of length, it might be advisable to know whether this was the length of the piece under normal contraction or its length when stretched to its elastic limit. It would be still better to know both lengths.

I have not attempted to bring out the many facts that can be adduced in favor of a machine rated at 40 degrees. This subject was very thoroughly covered in your issue of April 30, 1921, by Prof. F. B. Crocker; also in one of your editorials published some time prior to Professor Crocker's article. CHARLES F. NORTON.

Howell Electric Motors Company,
Howell, Mich.

Give the Consumer Some Consideration

To the Editors of the ELECTRICAL WORLD:

I have read with interest your editorial on the subject of motor ratings in the issue of March 18, page 519, together with the comments of two motor manufacturers found on page 882 of the May 6 issue.

As is usually the case in industrial controversies, the ultimate consumer is the one who foots the bill, although he does not have a voice in the proceedings. After having spent twenty years on the central-station and manufacturer's side of the fence, I now find a very different viewpoint as the representative of motor purchasers and central-station power consumers.

The change from 40-degree to 50-degree rating has had the tendency to increase the cost of motors per unit of actual capacity and also to increase the cost of purchased power to run them. Manufacturers of 50-degree motors have not frankly stated that they merely took a standard 40-degree motor, gave it a new 50-degree rating of the next high horsepower size, and fixed the price somewhat higher than had been charged for the 40-degree rating. For example, a 20-hp., four-pole,

60-cycle motor of prominent manufacture sold for $220 as a 40-degree motor, but after receiving its christening as a 50-degree machine it was rated at 30 hp. and sold for $262. Moreover, the injustice to the ultimate consumer does not stop with the purchase of the motor, for he must now and forever after pay the central-station demand charges, which in most cases are based on the horsepower rating stamped on the motor name plate. The consumer is the loser, furthermore, in the matter of efficiency, for motor performance sheets generally show a lowering of efficiency after the three-quarters load point is passed. Marking up to the 50-degree basis and operating full rating is the same as operating the motor rated at 40 degrees at 25 to 50 per cent overload, with consequent lowered efficiency.

It is perhaps significant that the most faithful exponents of the 50-degree ratings appear to be the central-station companies and the syndicate controlling manufacturing interests. It would be refreshing to the consumers of motors and central-station power to have some consideration given to their interests by the manufacturers, the central stations and the technical press.

Selig & Wilson, Engineers, E. T. SELIG.
Harrisburg, Pa.

Economics as Well as Engineering Considered

To the Editors of the ELECTRICAL WORLD:

In an editorial in the March 18 issue of the ELECTRICAL WORLD entitled "A Machine Rating Should Express a Definite Limitation," by inference or omission the presentation of the facts relating to the 40-degree rating is open to misunderstandings. That editorial purports to compare an older way of rating electrical machinery with a new advanced method, an older indefinite, arbitrarily chosen rating with a new definite, accurately chosen rating, finally specifically referring to what is known as the 40-degree rating as the "older conception." By inference the 50-degree rating must be the other.

For their own guidance, the readers of the ELECTRICAL WORLD should be specifically advised by you as to what factors in connection with the 40-degree rating are "indefinite limitations," give merely "a general idea of its capacity," are more "arbitrarily chosen" than the corresponding factors in the 50-degree rating, or do not permit of as intelligent, accurate and scientific application of the machine to any known conditions of load or duty cycle as the 50-degree rating.

I do not believe that any advocate of the 50-degree rating would state that it expresses the absolute limit of safe temperature rise and provides no manufacturers' allowance or margin of safety. Compared with the 40-degree rating it is merely 10 degrees nearer that limit, but it is just as arbitrarily chosen as the 40-degree rating. It might just as well have been 49 degrees or 51 degrees, for no one would attempt to claim that the maximum temperature to which class A insulation can be heated indefinitely without deterioration has been scientifically determined within one degree of accuracy, or that there is no manufacturers' margin in the temperature gradient used from the hot spot to the point of measurement, or in the arbitrarily chosen ambient temperature.

It is stated that the Electric Power Club has indorsed the 50-degree rating, and one unfamiliar with the facts might naturally infer that the 40-degree rating, which was the original standard, is no longer a standard of the Electric Power Club. This is not the case. Both are standards of the Electric Power Club, both express definite limitations under accurately stated conditions, and both are arbitrarily chosen in the sense that all engineering standardization necessarily represents the selection of the fittest, with a relatively wide range of choice, as distinguished from the scientific measurements of some absolute fixed standard such as a weight or measure. In the field of engineering standardization it is always possible to select something else which would meet equally well the specified conditions, whereas in the determination of some scientific fact there can be but one accurate result.

The 40-degree rating is termed a "double rating" as certain definite limitations of overload performance are guaranteed. The 50-degree rating also carries an overload guarantee. Why is it not also a "double rating"? What you term a "double rating" is a standard of the Electric Power Club, and in the last sentence of your editorial the effect of such a standard is stated as "the obliteration of all conceptions of genuine standardization and the subordination of principles of accurate measurement to considerations of commercial expediency." This, for the editorial pages of the ELECTRICAL WORLD, is a rather serious indictment against the motives which prompt the standardization work of the Electric Power Club.

The whole controversy regarding the relative merits of the 40-degree or 50-degree rating is purely a matter of technique and of engineering judgment. Knowing the yardstick with which it is measured, a properly designed 50-degree rating can be applied to any known condition of load safely and successfully, and it is equally true that, knowing the yardstick with which the 40-degree rating is measured, it can be as safely and successfully applied to those same conditions. Under unknown, uncertain or changing conditions the engineer may choose to measure with the 40-degree yardstick, or, as he often does, get even a greater margin of safety in temperature by selecting a 50-degree rating of a larger capacity, although the latter course may mean sacrificing desirable operating characteristics because of underloading.

Any claimed advance in the art in order to justify itself must possess some economic benefits to the consuming public, and it is desirable that this controversy be discussed from its economic standpoint and not purely from an engineering technical standpoint. I, therefore, refer the reader to page 1115 of this week's issue of the ELECTRICAL WORLD, where the economic phases of the situation are discussed.

CLARENCE L. COLLENS, 2D,
Reliance Electric & Engineering Co., President.
Cleveland, Ohio.

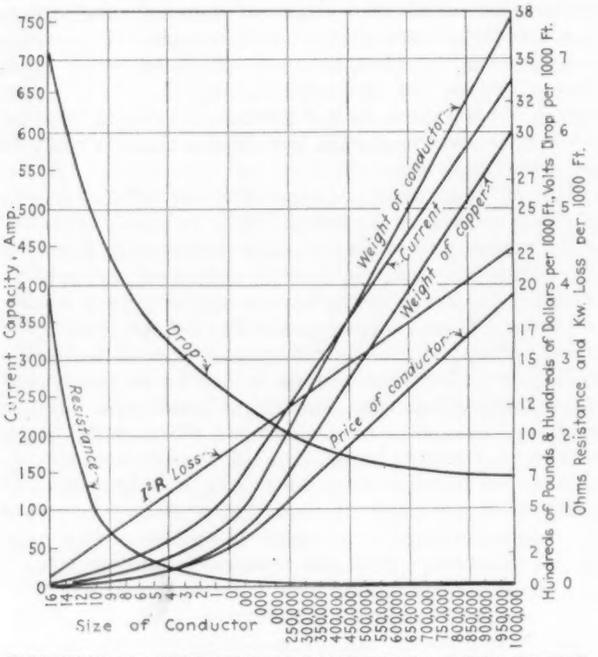
[In the editorial to which reference is made we did not aim to criticise the so-called "double rating" of the 40-degree motor, but to emphasize the need for a *single standard* of rating. The term "double rating" in the last paragraph of the editorial should be so interpreted. This Mr. Collens has also emphasized by his example of multiplying frame sizes, in the fourth paragraph of his statement on page 1115. A single standard of rating of electrical machines, whether it be a 40-degree basis or a 50-degree basis, we believe to be the only practical solution of the motor-rating dilemma. And it will matter little in the course of any reasonable period of adjustment, say twenty years, which of these bases is adopted, if it is made plainly evident that one only is the standard.—EDITORS.]

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Method of Obtaining Most Economical Size of Conductor

IN RUNNING wiring around a plant it is sometimes economical to use a conductor larger than that required by the National Electrical Code. The resistance loss in the larger wire will be less. This will mean an energy saving which may more than pay for the extra cost of the larger wire. In determining just



VARIATIONS OF CONDUCTOR CHARACTERISTICS WITH THE SIZE OF THE CONDUCTOR

which wire size will be the most economical the accompanying chart will be of use. The curves indicate the relationship between the size of copper and (1) weight of conductor, (2) weight of conductor with rubber insulation, (3) maximum current based on the code rulings, (4) resistance, (5) I^2R loss with maximum current, and (6) the voltage drop with maximum current.

An example of the way to determine the most economical size of wire will indicate one of the uses of the characteristic curves. With a 500,000-circ.mil cable, the drop is about 8.5 volts per 1,000 ft. and the I^2R loss about 3.1 kw., with the maximum current as determined by the code. The price of this cable, based on copper at 15 cents per pound, is about $1,050. At 2 cents per kilowatt-hour for a period of ten years the cost of the I^2R loss will be $5,400. Now if a 1,000,000-circ.mil cable were used in place of the above, it would not be loaded to capacity. The drop in this case is 4.2 volts. The price of the conductor would be $1,945. But as the current would be the same in each case and the resistance is reduced by one-half, the corresponding cost of the I^2R loss would be about $2,700. At the end of ten years the cost would be $6,450, against $4,645 for cables of 500,000-circ.mils and 1,000,000-circ.mils respectively. These figures, of course, do not take into consideration difference in erection costs nor do they allow for interest and depreciation.

Interest at ten per cent, compounded annually, on the difference in first costs would be about $1,426, and the additional depreciation could be taken at $444, making a total of $1,870 at the end of ten years. At that time the costs would be approximately equal. This indicates the possibility of an ultimate saving by the use of a larger conductor than necessary for the current if a decreased drop in voltage might be permitted and if a reduction in the resistance would not endanger the generating plant equipment in the event of a short circuit.

D. W. BLAKESLEE,
Jones & Laughlin Steel Co., Electrical Engineer.
Pittsburgh, Pa.

Average Cost of Trimming or Removing Trees Is $1.84 Each

THE cost of tree trimming along transmission lines is a subject on which very few data are available. This is due to the fact that it is engaged in only for a few days each year, generally in the spring, and is hurried through with and forgotten until it looms up again the next year. The following data and information were collected in order to gain a more accurate knowledge of the average time and cost of trimming the shade trees commonly met with in towns or cities.

To obtain a good average, trees most commonly used for shade, and therefore the ones generally encountered along the transmission or service lines, were selected. Of the total number so taken the greater majority were South Carolina poplars, these being very numerous because of their fast growth, which gives them wide popularity as shade trees. Other varieties selected were elm, maple, locust and buckeye.

The trees trimmed varied in height and spread from young ones that could be trimmed from the pavement with trimmers to those that necessitated climbing and the lowering of the severed limbs with a hand line. A few of the trees were merely topped, but the majority were closely trimmed, several being entirely removed. A separate record was kept of the ones removed so that a comparison could be made between them and the trees which were only trimmed.

COST DATA FOR TRIMMING TREES ON TRANSMISSION SYSTEM.

	Trimmed	Removed	Total
Number of trees	87	16	103
Number of hours required	285	86	371
Number of hours per tree	2.96	5.37	3.34
Average labor cost per hour	$0.55	$0.55	$0.55
Cost per tree	$1.63	$2.94	$1.84
Total cost	$141.90	$47.30	$189.20

The trimming was done by two linemen. One groundman was kept busy piling the brush in piles for loading, while another groundman and the truck driver piled the brush on the truck on which it was hauled to a dump heap for burning. Two groundmen remained at the dumpheap to see that the brush was entirely consumed and also that the fire did not spread.

The accompanying table gives a summary of the data. The average cost of labor per hour was calculated by adding the hourly rate each man received, including the line foreman, and dividing by the number of men.

C. N. HARMAN.
Wellsburg Electric Light, Heat & Power Company,
Wellsburg, W. Va.

Costs of Heat-Treated Parts Reduced to Minimum by Electric Furnace

AS THE higher-priced, improved heat source obtained with the electric furnace has successfully withstood the competition of existing fuels, there must be other factors of greater importance in the heat treatment of steel than the furnace operating costs, a fact not commonly recognized by the average furnace user. The most prominent among these other factors are reduced costs of subsequent operation, reduction in the number of rejections, increased life of products, with more satisfactory service.

To determine to what extent these factors will overcome higher furnace operating costs, an accurate cost analysis is necessary which will show the influence of furnace operating costs on the cost of the finished product. The actual ultimate costs of several heat-treated parts, together with the costs of heat-treating and electricity used, are given in the accompanying table. Attention is directed particularly to the last column, in which is shown the part that electricity plays in the ultimate cost. The power rate for all items is taken at 1½ cents per kilowatt-hour.

The six dies listed in the table were heated in the resistance furnace shown on the left in Fig. 1. A similar furnace was used for preheating and an electrically heated oil bath used for drawing. These furnaces and the oil tempering bath are maintained at constant temperature throughout the day, and the cost of power thus used is apportioned among the dies treated over a certain period. If the furnace could be operated at full capacity constantly, the cost of the electricity would be much below the values given.

During the twenty-five months that this furnace has been in operation there have been no interruptions of service, and the only expense incurred has been the replacement of a relay coil on the control panel. No deterioration in the metallic resistor heating element is apparent after the twenty-five months' continuous service. The only attendance necessary is occasional oiling of the automatic control apparatus and putting in a roll of record paper. The controlling of the temperature and the throwing on and off of the power are entirely automatic.

The total cost of electricity in heat-treating these dies amounts to one-third of 1 per cent of the ultimate cost of the dies. Subtracting from this the cost of other kinds of fuel will give the amount that must be offset by the other factors, such as the reduction of rejections, etc. In the case of this die-heating furnace the cost of electricity is virtually the same as the cost of oil. Extensive tests were run on similarly constructed oil and electric furnaces to determine the policy of the General Electric Company on future tool-treating furnace installations. The cost of operating the oil furnace was 23 cents per hour with oil at 13 cents, and the cost of the electric furnace was 10 cents per hour. With oil at its present level the costs are about equal.

In certain localities this would not be the case, and we must then look to the other features to justify the use of electric furnaces. In the case of these dies the most prominent of the factors are the reduction of rejections, lower costs of subsequent operations and longer life of the dies. Unfortunately, accurate data are not available on these factors, but in the opinion of the foreman in charge of the work they amount to several per cent, the rejections alone being reduced over 1 per cent, or more than the total cost of electricity.

The items in the table from 7 to 12 for gears and die blocks are at present treated in an oil furnace, the cost of the electricity having been calculated on the basis

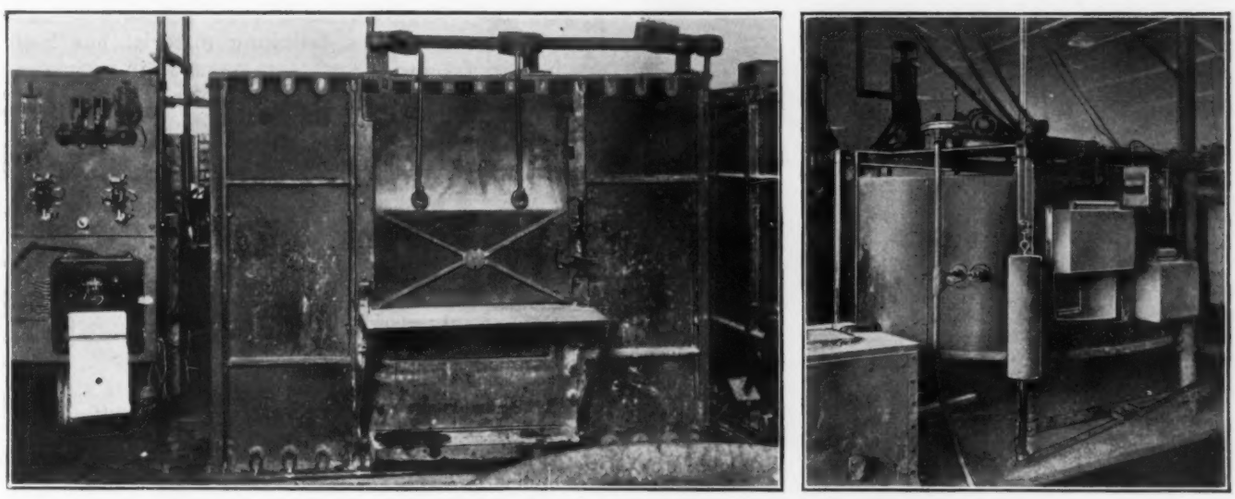


FIG. 1—ANALYSIS OF OVER-ALL COST OF HEAT-TREATED PARTS INDICATES THAT POWER COST IS ONLY ONE-THIRD OF 1 PER CENT OF TOTAL COST OF DIES

Left—Electric resistance furnace with panel and instruments for automatic temperature control. Right—Rotary annular electric furnaces designed for maintaining a temperature of 1,650 deg. Fahr. and used for heat treating gears.

of experience with electric furnaces handling similar work. Electric furnaces are contemplated for these parts, as a cost analysis indicates that the increased cost of electricity will be more than offset by the improvement in quality.

A furnace with a rotating annular ring hearth, shown on the right in Fig. 1, was used for heating the gears tabulated in the last item of the table. This is one of the three-phase, 220-volt furnaces installed at the plant of the Standard Equipment Company, Cleveland, Ohio. The cost of electricity for heating these gears is based on a thirty days' operation. The number of gears heated during that time was 9,510, weighing 39,107 lb.

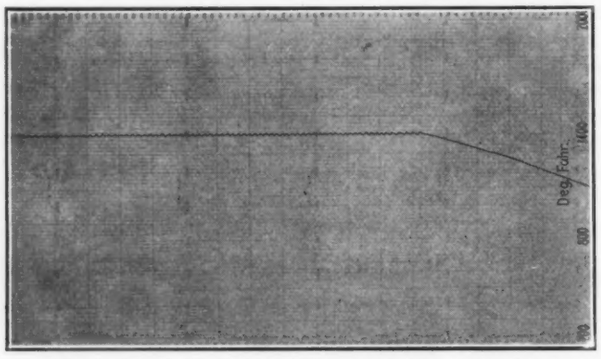


FIG. 2 — AUTOMATIC CONTROL MAINTAINS CONSTANT TEMPERATURE IN RESISTANCE FURNACE (FIG. 1)

The cost of oil used in heating these same gears is approximately ½ cent, or about one-fifth the cost for electricity. Here again the increased cost is offset by the reduction of rejections and lower cost of subsequent operations.

The features of the electrically heated furnace of the metallic resistor type, which make possible this improvement in quality, are: (1) Low temperature of heat source; (2) accurate and reliable automatic temperature control; (3) uniform and unvarying temperature distribution; (4) absence of the severe oxidizing and corroding common to some fuel-fired furnaces.

COST FIGURES FOR HARDENING AND DRAWING STEEL SHOW THAT SUBSEQUENT OPERATION MUST BE CONSIDERED

Item	Part	Factory Cost of Parts	Cost of Heat-Treating	Cost of Electricity for Heat-Treating	Electricity in Percentage of Total Cost
1	Segment combination die	$1,380	$13.50	$4.16	0.3
2	Segment combination die	1,138	12.00	3.70	0.32
3	Round blanking die	638	5.03	1.50	0.23
4	Segment blanking die	782	9.45	2.92	0.37
5	Die	795	10.53	3.43	0.43
6	Die	875	8.66	2.67	0.3
7	Gear	234	13.00	3.70	1.5
8	Gear	263	15.00	4.44	1.7
9	Gear	338	21.00	6.25	1.8
10	Gear	391	26.00	7.60	1.9
11	Gear	455	30.00	9.06	2.0
12	Die block	110	1.75	0.65	0.6
13	Gear*	†5	.....	0.03	0.6
	Total of all above	$7,404	$165.92	$50.11	0.68

* Hardening only, without drawing. † Estimated.

The large area of the heat source permits it to operate at a temperature only slightly higher than that of the parts being heated and renders overheating of any part impossible. In the fuel-fired furnace, except where a muffle is used, the heat source or flame is several hundred degrees hotter than the work; consequently there is always the danger of overheating portions of the charge, especially parts having thin sections. This overheating results in distortion and excessive scaling.

Automatic control of temperature insures constant conditions in the furnace and makes possible the duplication of results from day to day. A typical temperature control chart for a resistance furnace operating at 1,400 deg. Fahr. is shown in Fig. 2. It can be seen that the maximum temperature variation is about 5 deg. Fahr., and since the air changes temperature much more rapidly than the charge, it is apparent how accurately the temperature is maintained.

The problem of choice of steel-treating furnaces is chiefly the problem of determining the effect of the various furnaces on the over-all cost of the heat-treated part. A careful analysis along the lines outlined may in many cases reveal that furnace-operating costs are of secondary importance.

C. L. IPSEN,
General Electric Company, Designing Engineer,
Schenectady, N. Y. Industrial Heating Department.

Recent Unit Costs of Central-Station Distribution Material

FROM the 1921 cost sheets of a Massachusetts central-station company the following material has been selected as of value to engineers engaged in estimates.

COST OF DISTRIBUTION MATERIAL IN A MASSACHUSETTS CENTRAL STATION

	Unit Cost In Dollars
Material wires, cables and attachments:	
427 lb. No. 2/0 weatherproof wire, per lb.	0.28
4,330 ft. No. 8 weatherproof wire, per lb.	0.12
7,644 ft. No. 6 weatherproof wire, per lb.	0.226
279 ft. No. 2/0 three-conductor, 7,000-volt, lead-covered cable, per foot	0.25
5 lb. ¼-in. stranded-steel guy wire, per lb.	0.116
48 lb. ⅜-in. stranded-steel guy wire, per lb.	0.105
15 No. 2/0 copper lugs, each	0.446
9 lb. lead sleeves, per lb.	0.118
7 three-conductor flanged-cable end bells, each	21.85
36 T-connectors for ½-in. pipe, each	2.94
3 250,000-circ.mil connectors, for ½-in. wire, each	5.88
Switches, cutouts, etc.:	
3 60-amp., 3,000-volt oil switches, each	43.96
1 150-amp., 3,000-volt, two-pole oil switch	41.40
1 150-amp., 3,000-volt oil switch	46.94
9 600-amp., 13,200-volt Delta-Star No. 37,613, type U-141 switches (2⅜-in.), each	69.17
16 300-amp., 15,000-volt, indoor-type, disconnecting switches, each	19.30
2 100-amp., 2,500-volt disconnecting switches, each	6.67
2 300-amp., 600-volt disconnecting switches, each	9.58
3 100-amp. cut-out boxes, each	17.99
1 30-60-amp., 250-volt porcelain cut-out	4.25
15 G. E. primary cut-out boxes, each	1.54
Meters, instrument transformers, etc.:	
40 5-amp., 110-volt, two-wire watt-hour meters, each	8.16
181 10-amp., 110-volt, two-wire watt-hour meters, each	9.57
10 50-amp., 110-volt, two-wire watt-hour meters, each	17.80
240 5-amp., 220-volt, three-wire watt-hour meter, each	9.35
116 10-amp., 220-volt, three-wire watt-hour meter, each	9.67
6 15-amp., 220-volt, three-wire watt-hour meters, each	11.79
40 25-amp., 220-volt, three-wire watt-hour meters, each	13.02
2 5-amp., 500-volt watt-hour meters, each	112.00
2 200-amp. current transformers, each	17.60
2 300-amp. current transformers, each	18.70
2 50-watt, 220-volt potential transformers, each	22.00
1 60-cycle, 13,200-volt potential transformer	77.00
5 50-amp., 110/220-volt ammeters, each	19.32
1 three-phase, 60-cycle, 110-volt power-factor meter	60.45
3 Thermometers with centigrade scales, for transformer installation, each	4.00
Miscellaneous:	
1 46-kva., 200-amp. feeder voltage regulator— Regulator in station	$1,359.00
Wiring cost	10.06
	$1,369.06
11 lb. asbestos cloth, per lb.	2.96
3 No. 8,216 Thomas "F" bushings, 13-in., each	8.25
40 Schweitzer bus supports for 4-in. pipe size, each	5.34
1 20-amp., 1,000-cp. tungsten lamp	4.12
15 ft. arc lamp chain, per foot	0.62
1 Brady mast arm	32.34
5 Cross-arm braces, each	1.65

In general, these costs represent actual prices charged the company f.o.b. factory.

Boston, Mass. FIELD EDITOR ELECTRICAL WORLD.

Adequate Protection Essential on Station Auxiliaries

SPECIAL precautions should be taken to inclose the electrical equipment used in the supply and control of motors driving auxiliaries in boiler and turbine rooms, it being probable that those employed there will not be familiar with such equipment. Present practice, as outlined by H. C. Albrecht, electrical engineer of the Philadelphia Electric Company, in a recent paper presented at a joint meeting of the New York Section of the A. I. E. E. and the Metropolitan Section of the A. S. M. E., usually includes one or more of the following provisions to give reliability of service and ease and simplicity of control:

1. Remote control of those auxiliary motors so located that manual control would complicate and increase the difficulty of operation.
2. Arrangement of important auxiliary motors so that after failure of supply they will automatically restart and come back to speed immediately upon restoration of service, without requiring any attention on the part of the operator.
3. Differential-relay scheme of protection of individual 2,300-volt motors and their supply cables which provides for automatic disconnection upon failure but prevents disconnection from any other cause.
4. Lock-out features on certain motors normally handled by others than the electrical operating force, particularly in boiler rooms, so that upon failure it will be impossible for the attendant to throw this equipment back on the line.

In considering the extensive use of electric drive it is necessary that, because of the importance of the service, the selection and layout of the equipment should be such as to give a high degree of reliability. In case of trouble defective equipment must be immediately isolated with a minimum effect on other apparatus.

New York, N. Y. FIELD EDITOR ELECTRICAL WORLD.

Coal Pile Fires and How to Prevent

THE secret of preventing coal piles from catching fire by spontaneous combustion lies in the manner of building up the piles. Two simple rules that, if followed, will go a long way to prevent fires are: (1) In unloading coal with buckets drop the load in a bulk. Don't let it trickle out into cone form. (2) Build the pile in flat layers.

In building up the layers of coal proceed as if building a brick wall. Drop the first load flat in a bulk, lay the next load close to the sides of it, the next to the side of that, and so on until one layer is completed with a flat top. This keeps the mixture of fine and coarse coal together.

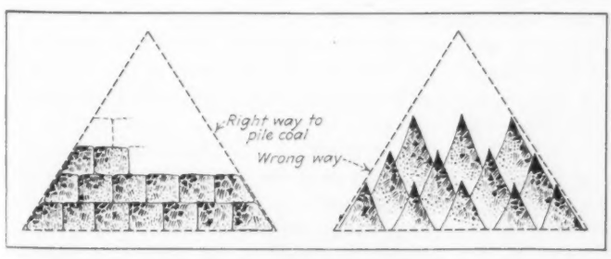


FIG. 1—METHOD OF STORING COAL

Right—Coal piled in shape of cones separates the fine and coarse. Left—When piled in layers the mixture is kept together, preventing air filtering through.

If the coal is dropped from the bucket in cone shape, the heavier coal rolls down the sides of the pile, leaving the fine coal in the peak. The cones that are formed will have the heavy coal at the bottom and sides, through which air will enter and may set the whole pile on fire. By building the coal pile in layers this separating of the fine coal and of the larger pieces of coal is prevented, and the air will not filter through so easily. The right and the wrong ways of coal piling are shown in Fig. 1, where on the left, the coal is dumped quickly, thus preventing it from separating with the large coal at the bottom and the fine coal at the top. On the right is shown the formation of internal cones produced by improper piling.

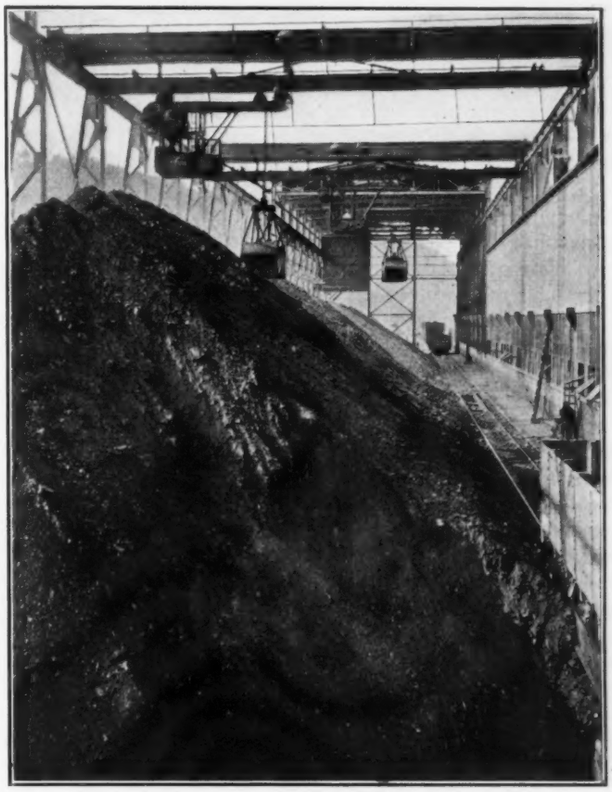


FIG. 2—COAL PILED IN SUCCESSIVE LAYERS PREVENTS FIRES

Some coal will catch fire no matter what precautions are taken. This indicates excessive sulphur and iron. The writer has seen a ray of sun through the roof ignite this kind of coal, but fortunately there is very little of it on the market.

Once the coal pile is built for storage, rehandle the coal as little as possible. For use take a layer off the top and build up as before, not forgetting that the secret lies in keeping the surface flat and avoiding internal cones.

A storage pit of about 7,000 tons of coal is shown in Fig. 2. The pile is 500 ft. long by 60 ft. wide. It is in the form of a pyramid or cone with the internal cones carefully avoided. In another pile next to this 10,000 tons is stored. With this amount of coal in contact it is important to know how to prevent it from catching fire, and the secret is to build the pile in layers.

The Chase Companies, J. E. WILLIAMS,
Waterbury, Conn. Chief Engineer.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies. Advertising. Selling and Service Methods

House-to-House Appliance Selling

From a Paper by O. R. Hogue, Commonwealth Edison Company, Before the Recent Joint Convention Illinois Utility Associations

DOOR-TO-DOOR canvassing does not mean the front door; it means the back door, where we find the lady of the house who does her own work and who above all others appreciates labor-saving devices of all kinds. I shall endeavor to explain somewhat in detail our plan of handling this class of business.

O. R. HOGUE

We have found from experience that there is an enormous turnover in salesmen doing this class of work, and in order to maintain a force of one hundred men who can properly sell electric appliances, it is necessary to give them at least an initial knowledge of the appliances which they are to sell, to instruct them in the policy of the central-station company and to get them started on salient selling talks. We have connected with the Commonwealth Edison Company the Central Station Institute, where they are taught the merits and value of the appliance, and how to give this information to the prospective customer. They also receive briefly the mechanical and electrical knowledge that is just as necessary a component in their general knowledge as how to convince the "prospect" that the appliance is something that will be of value to her in her every-day life. After this instruction the men are turned over to the campaign captains, with a concrete foundation on which to start.

Our policy is to sell from door to door. We use electric trucks capable of holding a fair quantity of appliances of various kinds, which is supervised by a captain who has under him a crew of from ten to fifteen or sixteen salesmen, never more than that number. These wagons are loaded at one of our warehouses each morning at about 8 o'clock, under the direct supervision of the wagon captain, as he is called, and goes immediately to a designated location where the crew has been instructed to meet the captain. The city is divided into districts, with definite boundary lines, beyond which any one wagon is not permitted to sell. The captain allots districts within his district to each man, and the work of the day is begun at 8:30 at the latest. Each member of the crew has a sample of the appliance, whatever it may be—an iron, a toaster, a lamp, etc.—and he proceeds to the district allotted to him. If he sells his goods, he leaves the article and returns to the wagon for another.

There are only certain lines of goods that can be sold satisfactorily in this way—the smaller articles, easily handled and which sell for sums within the reach of the moderately situated citizen. We originally figured that this back-door campaigning was only a summer proposition, but for the past year we have maintained our campaign force during the entire year with exceedingly satisfactory results. We shift from irons to heaters, to portable lamps and to a combination iron and ironing board at a special price, of which we have recently sold about eight thousand. These, together with percolators and toasters, warming pads and many other similar articles, seem to be in demand.

The selling of portable lamps is an especially new idea with us and we expect to continue this line indefinitely. We are also developing a line of smaller articles such as fuse plugs and twin sockets which the men can carry in their pockets.

Compensation of Salesmen

Many schemes have been tried to compensate the salesmen on an equitable basis, such as a guaranteed sum per week and a salary and commission basis; but we have found from long experience that the only satisfactory way is the commission basis, and the commission must be large enough to attract a good salesman. A dollar per iron we feel should be the minimum, and $1.50 for a portable lamp selling at various prices up to $15. The captain of the crew is paid a straight salary. If to this salary a bonus on sales made by his crew is added, he will work that much harder to increase his wagon's sales, not only increasing his own earning capacity, but incidentally the earning capacity of the men in his crew. A prize system for the wagons with the largest sales over and above a stipulated sum works wonders. An extra bonus for the men selling over a certain number on some particular article during any given week also adds zest to the selling.

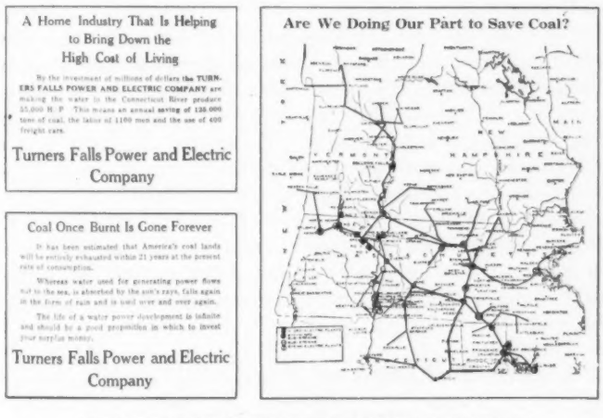
In conclusion, I wish to emphasize that this class of merchandising can only be sold in large quantities by this door-to-door canvass, and it is a profitable business from the standpoint of merchandising. Moreover, it is a very essential line of business for the central station, as it is the very best means of increasing the customers' use of central-station service. The customer first becomes interested, perhaps, in the electric iron; then a percolator or a toaster is added to the list, and finally the greater labor-saving devices, such as the washing machine, mangle and vacuum cleaners, are installed in the home. Each appliance adds something to the customer's bill for energy for the month; multiply this by the vast number of customers using these appliances, and the income to the central station for additional energy is quite considerable.

Value of Hydro-Electric Development Featured in Company's Advertising

FOR more than a year at frequent intervals the Turners Falls (Mass.) Power & Electric Company has been "carrying" a series of advertisements in the local press featuring various phases of public utility development and emphasizing the value of hydro-electric plants, the meaning of electrical service to the public and the fundamentals of electrical investment as a field for putting savings at work. Many interesting points have been included in these advertisements relative to the magnitude of the company's service and its constructive influence upon industrial and domestic life within its territory.

Emphasis upon the fuel-saving characteristics of the Turners Falls system was made in an early display which showed that one day's operations of the company's hydro-electric plants saves twenty carloads of coal. This company supplies energy to nearly every community in three counties of west-central Massachusetts and is interconected with the New England Power Company to the mutual advantage of the two utilities and the public. One of the advertisements, reproduced herewith, called attention to the value of this interconnection, showing the two systems in map form and indicating the desirability of further coal savings by future steam railroad electrification supplied through co-operative service.

Reductions in the cost of living through the use of


A Home Industry That Is Helping to Bring Down the High Cost of Living
Turners Falls Power and Electric Company
Coal Once Burnt Is Gone Forever
Turners Falls Power and Electric Company
Are We Doing Our Part to Save Coal?

TYPICAL ADVERTISEMENTS REFLECTING MODERN PUBLIC POLICY IDEAS

hydro-electric service, the recurring cycle of water-power utilization and the interest of such a development from the standpoint of the home investor have also been stressed in these advertisements.

Efficiency of Electric Heat Control Makes Industrial Window Display

TO DEMONSTRATE by a window display the accuracy of electric temperature control now available in industrial heating, the Worcester (Mass.) Electric Light Company recently assembled a heating unit, an automatic cut-off switch and a recording thermometer as shown in the accompanying photograph, arranging the apparatus for close inspection from the street outside the main offices. The heating element, which was taken from a standard electric radiator, was mounted in a box, the temperature of which was automatically recorded on a moving circular chart at the left front. As the temperature fell below a predetermined point an automatic switch restored the energy supply, a pilot light in the box showing when current was on and off. An even temperature line with a variation of approximately only one degree resulted, and this required the consumption of energy only about half the time. The demonstration attracted the interest of passers-by, especially those following manufacturing pursuits.

FEATURING AUTOMATIC TEMPERATURE CONTROL

What Other Companies Are Doing

Salem, Mass.—Ten thousand letters descriptive of the sales service of the Salem Electric Lighting Company were distributed in one day recently to commuters of the Boston & Maine Railroad at the Salem station between 5:45 a.m. and 9:45 p.m. A pocket-sized time-table was inclosed with the letter. Only ten letters were picked up after the distribution, showing that they were well received by the commuters. Already several good prospects for electric service have been reported.

Louisville, Ky.—The energy consumption of eighty-one industrial establishments in Louisville for the month of March, 1922, totaled 2,204,198 kw.-hr. This is an increase of 32.7 per cent over the same month in 1921. Since the first of the year the Louisville Gas & Electric Company has connected more than 6,000 hp. in motors and other power equipment to its lines. Of this equipment, 3,450 hp. represents the aggregate load of seven customers, and only one of these, with a connected load of 400 hp., is a new customer. The six others represent additions to existing installations or replacements of isolated steam plants with central-station service.

Salt Lake City, Utah.—The Utah Power and Light Company is conducting a very aggressive campaign on the sale of its 7 per cent preferred stock, and the results up to the present time have been highly satisfactory. Features of the campaign are newspaper advertising, window displays and poster advertising. The employees of the company are taking an active part in selling the stock.

Reading, Pa.—The Metropolitan Edison Company is offering its preferred stock to the amount of $1,805,830 to the public. The company has announced that the additional funds are to be used in improvements to its plant and system. E. L. West is president of the company.

Manufacturing and Distributing

Devoted to the Discussion of Production, Distribution and Market Development, the Business and Economic Problems of the Manufacturer, Jobber, Agent, Contractor and Dealer

Stabilizing the Radio Equipment Market

By Frank S. Price

President Pettingell-Andrews Company, Boston, Mass.

THE present demand for radio material by the public can be likened to a stampede of the old days to the gold fields. The dealer in electrical supplies who obtains a small stock of this apparatus finds no difficulty in making quick sales, and it is no exaggeration to say that at this time it is well-nigh impossible to build up stocks of such material for distribution purposes. It is clear that for some little time to come the demand will continue to exceed the supply. Eventually, however, we may expect an abrupt change in these conditions, and some morning the trade will awaken to find that the supply exceeds the demand. There is good reason to believe that the radio business has a substantial future, provided it is built on a sound basis. But such a basis cannot be built while there is a wild scramble for business, pyramiding of orders and a general repetition of the mistakes of the inflation period during and after the war.

F. S. PRICE

In the stampede to the gold fields thousands of men neglected their regular business for a vision of wealth, and history tells us that only a small percentage of these thousands came back with gold. It is time for a word of warning against the neglect of the "bread-and-butter" trade by the dealer. There is grave danger of a serious reaction later if he now permits himself to be swept off his balance by the great demand for radio apparatus. This is said without any intention to discredit the future of the radio industry, but we should not permit our optimism to blind us to existing facts.

Some manufacturers, in their efforts to secure business during this early rush, are making inferior material, and not a few distributers are making definite promises of delivery to dealers and taking orders for radio material on the basis of these promises. In reality, no definite, trustworthy promises of delivery of dependable material can be made at this time.

I believe that the best service and the most economical distribution of radio material can be had at present if the manufacturers of high-grade apparatus will arrange to distribute stock in each case through a limited number of wholesalers, and it would appear that the electrical supply jobber who is properly equipped to handle such distribution on a wholesale basis is the one best qualified to function in this way. On his part, I believe that the jobber should refrain from retailing this equipment in his own establishment, and that he should sell radio material to a limited number of retailers who are qualified to do this class of business and not to those who are unprepared to furnish the service required by a rapidly developing and extremely technical branch of the electrical industry.

A radio man technically qualified is at present more important to the distributer than a man with sales ability. The retailer, on his part, must see to it that the ultimate consumer receives absolute satisfaction. The marketing of radio material under present conditions by many stores which do not employ a man equipped with the requisite technical knowledge of the product and the merchandising of equipment of inferior design and construction are most undesirable. The time may come when the development and standardization of radio material will permit its sale to the public by music stores or other non-electric retailers, but that time is still far off.

By making the arrangements above indicated the manufacturer, distributer and dealer will take a step toward the stabilization of the market greatly to be desired. Economically, the volume of business to be handled will enjoy the same advantages that accrue to a well-co-ordinated system of distribution in other electrical fields. The public will be "serviced" in a way scarcely possible during a wave of general inflation, and to the extent that the public receives full satisfaction will the foundations be established for permanent business in this branch of electrical development.

The Relation of Trade Discount, Turnover and Profit

By J. J. Keith

CRITICISMS of the discounts on electrical appliances and supplies are frequently made by dealers because, as they say, there is not sufficient spread. Their costs of doing business are almost as great as the discount, and the spread is not sufficient to leave any margin of profit after the overhead charges are paid. Profit, however, depends largely upon the rate of turnover of any article. That is, the more rapid the rate of turnover of an article, the smaller is the amount of annual overhead expense chargeable to it.

As an illustration, consider a small dealer whose stock on hand runs about $25,000, whose annual sales are $50,000 and overhead charges $10,000. With annual sales of $50,000 from $25,000 stock the whole stock is turned over twice a year. An overhead of $10,000 on sales of $50,000 means that the average overhead charge per sale is 20 per cent. Therefore on any article that it takes six months to sell there should be allowed 20

per cent of the selling price as the cost of doing business.

Some articles, of course, move faster than the average turnover of twice a year; still there are others on which the rate of turnover is not more than once a year. Taking as correct the 20 per cent overhead on an article that it requires six months to sell and dividing 20 per cent by six, there results 3⅓ per cent a month overhead which should be charged against every article in stock. If an article is turned over once in nine months, multiply 3⅓ per cent by nine, which is 30 per cent, and the selling price of that article should include this 30 per cent for overhead charges. If it takes twelve months to sell it, 40 per cent overhead charge should be included, or if an article takes only three months to sell, 3⅓ per cent times three equals 10 per cent, or the overhead chargeable against this particular item. In determining whether the discount allowed on a purchase is enough to cover the cost of doing business and leave a fair profit, a table such as the following can readily be used:

Number of Months Required for Turnover	Per Cent of Overhead on Article	Number of Months Required for Turnover	Per cent of Overhead on Article
1	3⅓	7	23⅓
2	6⅔	8	26⅔
3	10	9	30
4	13⅓	10	33⅓
5	16⅔	11	37
6	20	12	40

The above table is, of course, applicable to a business where the stock is turned over on an average twice yearly. However, a dealer can readily figure up his average stock investment, total up his year's sales, add up his year's overhead and make up a table of monthly overhead percentages which will apply to his own particular business.

By applying this table of overhead charges to the rate of turnover a dealer can determine whether the spread or discount is sufficient to take care of the overhead charges on any item in stock. This method gets away from the practice of applying average figures to individual items which have different rates of turnover. It may be found that fast-moving articles are carrying most of the business, while the slow movers on which the overhead charge should be from 30 to possibly 40 per cent eat up the entire margin of profit and in reality are being sold at a loss.

Causes of Business Failures

EVERY year *Bradstreet's* issues a tabulation of business failures in the United States and classifies them by causes. Eleven causes are given and these are divided into two general groups—those due to the fault of the person failing and those arising from circumstances beyond his control. As might be expected, in a year such as 1921 the proportion of causes falling within the latter group is higher than normal, but even then the causes due to the fault of the person failing make 75 per cent of the total.

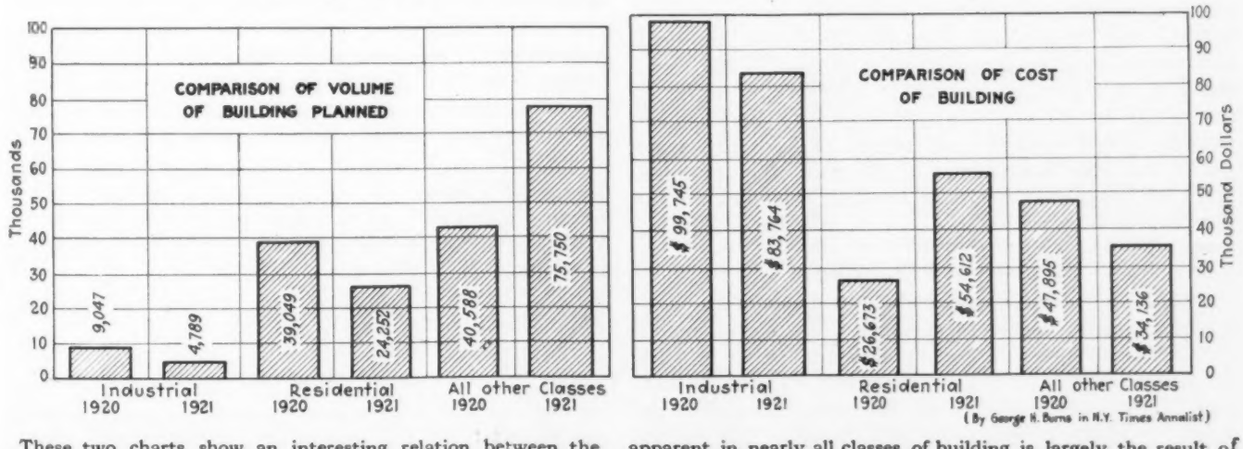
Of all failures, 32 per cent were due to incompetence. Lack of capital follows, the percentage from this cause being 29.3. But lack of capital is only one particular manifestation of incompetence, and the same thing is true of inexperience, which accounts for 5.7 per cent of the business wreckage for the year. Other causes falling under faults of the person are fraud, neglect, unwise extension of credits, personal extravagance and speculation outside of the business.

That a year when economic causes were operating so adversely as to raise the proportion of failures from specific causes to the highest figure since 1897 should still see three-quarters of the failures due to personal reasons possesses one striking significance. That is the importance of the human factor in business. Inexperience, lack of knowledge of fundamentals, insufficient preparation for responsibilities are all reflected in the personal causes of failure. And this goes still further, for the victim of "specific" causes is often engulfed through lack of knowledge or judgment that would enable him to foresee adverse developments.

FAILURES IN UNITED STATES DURING 1921

Fault of Person Failing:	Number	Per Cent
Incompetence	6,404	32.0
Lack of capital	5,855	29.3
Inexperience	1,142	5.7
Fraud	931	4.7
Neglect	257	1.3
Unwise credits	230	1.1
Extravagance	82	0.4
Speculation	66	0.3
	14,967	74.8
Causes Beyond Control of Person Failing:		
Specific conditions	4,638	23.2
Failures of others	226	1.1
Competition	183	0.9
	5,047	25.2

Comparisons of the Volume and Cost of Building



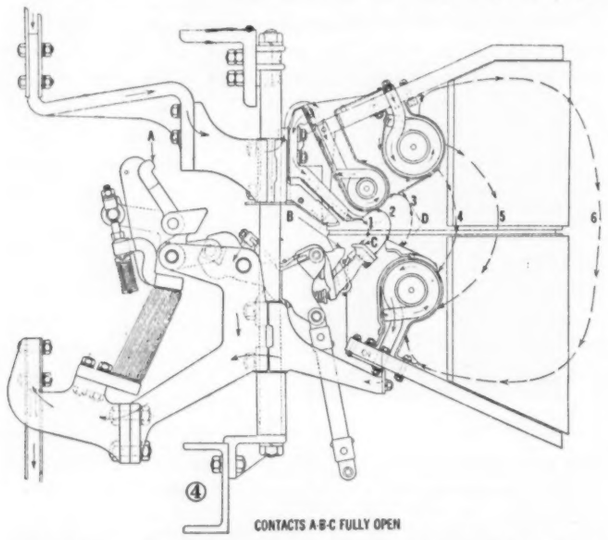
These two charts show an interesting relation between the decrease in cost of building and the increase in volume of new construction planned. The renewed activity which is now so apparent in nearly all classes of building is largely the result of lowered costs and is quickening business for the whole electrical industry.

Digest of Electrical Literature

Including Brief Abstracts of and References to
Important Articles Appearing in the Scientific and Engineering Press
of the World

Generators, Motors and Transformers

Air-Break Magnetic Blow-Outs.—J. F. TRITLE.—While there are many different types of magnetic blow-outs, this paper deals largely with the "individual" type, in which a blow-out coil is connected in series with each pair of current-rupturing contacts. It is with this type that most of the progress and studies have been made in recent years. Recently the use of magnetic blow-out contactors on alternating-current circuits has been extended to moderately high voltage and capacity. Short-circuit tests with these contactors on a 6,600-volt, 26,700-kva. alternator are described. During the three-phase tests the air-break magnetic blow-out contactors successfully ruptured 17,500 amp., the full short-circuit current at 5,500 volts, which is equivalent to 170,000 kva., three-phase. Oscillograph records of the voltage and current in each phase are shown and also illustrations of the arcs. The arrangement of a typical 5,000-volt breaker is shown in the illustration.—*Journal of the A. I. E. E.*, April, 1922.



5,000-VOLT, 3,000-AMP. ALTERNATING-CURRENT AIR-BREAK MAGNETIC BLOW-OUTS

This contactor was developed primarily for controlling the main motor circuits of the new 180,000-hp. battle cruisers for the United States government. Very exhaustive tests were made before and after the final designs were completed. The results amply met expectations as to the suitability of this type of contactor not only for ship propulsion but also for power-station service.

Lamps and Lighting

Flashlight Characteristics.—T. SPOONER and C. F. ROYCE.—Flashlamps were obtained from eleven manufacturers and tested in general as a unit; that is, each flashlamp was tested with its own battery and the battery judged on a basis of its life when used with the lamp for which it was designed. Some of the conclusions drawn from the tests were: (1) The long two-cell or three-cell flashlamps should be used to obtain the most useful light per dollar. (2) Seamless battery cases are superior for long shelf life. (3) Large-diameter lenses and reflectors should be avoided except possibly for illumination at a considerable distance. (4) Conical reflectors usually give the better light distribution. (5) More attention should be given to the uniformity of construction of the lamp bulbs for flashlamps. (6) As many flashlamp manufacturers purchase their bulbs from electric lamp manufacturers, a closer co-operation between the manufacturers is desirable.—*Electric Journal*, April, 1922.

Generation, Transmission and Distribution

High-Tension Insulators.—BORGQUIST.—The author reviews insulator development in Sweden during the last twelve years, describing and discussing different types of chain insulators employed on lines of 55,000 volts to 132,000 volts. A very early type, assembled with plaster of paris and ground marble, gave an average loss of 0.4 per cent per year during the years 1910-1921. In 1914 the Royal Swedish Board of Waterfalls designed a standard insulator unit, with rounded porcelain section, plastic compound on iron and porcelain surfaces and short-circuiting devices in the cement layers. Of this type 73,000 units were ordered for the Porjus and Alvkärleby projects, and during six to seven years of service these insulators have given a loss of only 0.005 per cent per year. Some Hewlett insulators of different manufacture are in use on the board's lines, but this body has felt that in its present state of development this type of unit unduly increases the cost of installation, at the same time not giving the same protection against arcing as the cap-and-pin type does. For a 132,000-volt line built last year cemented insulators were therefore used exclusively. One-half of the line is equipped with nine-unit chains of Ohio Brass standard with 10-in. units, the other half with eight-unit chains of ball-head insulators of German manufacture. Both types of chains have combined arcing and grading horns, which lower the dry flashover voltage by 7 per cent and reduce the maximum unit stress from 22.5 to 16.2 per cent of the total voltage for the American chain, and from 23.1 to 19.8 per cent for the German chain.—*Teknisk Tidskrift*, Jan. 7, 1922.

The New Power Plant of the H. H. Franklin Manufacturing Company.—A complete description is given of this 2,000-kw. plant, which is in Syracuse, N. Y. Its main feature is the manner in which the generating equipment was designed to satisfy the demands for exhaust steam for heating and process work.—*Power Plant Engineering*, March 15, 1922.

Development of 220-Kv. Transmission Lines in California.—A. W. COPLEY.—The problem of using voltages as high as 220 kv. for transmission purposes involves special study of the generators, transformers, circuit breakers for switching, insulators for supports and con-

densers for regulation. All of these points are very well covered by the author in his discussion of the developments being made by the Southern California Edison Company in its proposed 220-kv. circuit. The Pacific Gas & Electric Company is also considering a transmission line of this voltage.—*Electric Journal,* March, 1922.

Traction

Electrification of Chilean State Railways.—D. C. HERSHBERGER.—A complete description is given of this electrification, including the route over which the railway passes, the various weather conditions encountered, the electric locomotives with the tonnage and train weights they haul, sources of power supply and a description of all switching equipment employed.—*Electric Journal,* March, 1922.

Electric Motor Drives in Railroad Shops.—BERTRAM S. PERO.—The author discusses the selection, type and application of motors on different kinds of machine tools. Several illustrations are given showing the individual drive on machine tools.—*Railway Electrical Engineer,* March, 1922.

Installations, Systems and Appliances

Hydraulic-Automatic Electrode Regulation for Electric Furnaces.—J. RITZ.—An electro-hydraulic regulating system has been developed which is already in use in several electric foundries for adjusting furnace electrodes. Instead of contact-making relays, a revolving-field instrument similar to an alternating-current meter motor is used. This actuates a valve, which in turn admits water pressure above or below a piston in a pressure cylinder, thus raising or lowering the electrodes in the furnace. For a three-phase furnace three current transformers are required for the three regulating valves, as well as three electrode cylinders. The valve instruments may be arranged to regulate either for constant current or for constant wattage. A great many advantages are claimed for this new system. Of interest is a kilowatt-graph showing the great difference in uniformity of load between hand regulation and the automatic method.—*Brown-Boveri Mitteilungen,* March, 1922.

Electrophysics and Magnetism

The Motion of Electrons in Argon.—J. S. TOWNSEND and V. A. BAILEY.—An account is given of the motion of electrons in argon, showing that the loss of an electron in colliding with a molecule and the mean free path of the electron may be found from the experimental determinations of the velocity of the electron in the direction of the electric force and its velocity of agitation. Results show that the molecules of this gas are very different from those of nitrogen, hydrogen and oxygen.—*Philosophical Magazine (London),* March, 1922.

Properties and Uses of Micas.—A partial report of the Electrical Research Association (England) on this subject. Great difficulty was met in the investigations owing to the non-uniformity of nomenclature for the different kinds of mica. Considerable attention was therefore given to classification, which is given in tabular form. The article continues with specifications for mica, identification tests, the use of mica and micanite for commutators, and finally its use in ring and cone forms.—*Journal of the (British) Institution of Electrical Engineers,* March, 1922.

Electrochemistry and Batteries

Electromagnetic Motions in Electric Furnaces.—CARL HERING.—In a paper presented before the society a year ago the author described some of the more recently discovered forces of electromagnetic origin in those types of electric furnaces in which the current passes through the molten material. In the present paper he explains how a proposed law given in the former paper may be applied to the production by the current of certain desired motions, such as those for circulating or stirring liquid conductors in a furnace. Guides are given to aid one in determining whether such motions can probably be produced by the current. It is maintained that the former restrictions to only one such motion-producing force were not justified, and that many others formerly not accepted are possible.—*Paper presented before the American Electrochemical Society at Baltimore,* April 27, 1922.

Units, Measurements and Instruments

Sparkover Voltages Through Oil.—W. S. FLIGHT.—When considering the sparkover voltages through air it has been shown that the sparkover voltage varies directly with the barometric pressure. It has sometimes been considered that the sparkover voltage through oil depends on the pressure of the oil, but tests carried out by the author to investigate this point showed that there was no difference between the sparkover voltage of the gap employed whether immersed two inches or two feet below the surface.—*Beama,* March, 1922.

Measuring of Temperature of Electric Machines.—G. KEINATH.—A general review is given of the present status of measuring the internal temperatures of machines and transformers. The great importance of a reliable method for such measurements is emphasized, but at the same time it is stated that up to the present none of the existing methods gives fully satisfactory results.—*Elektrotechnik und Maschinenbau,* Feb. 26 and March 5, 1922.

Telegraphy, Telephony and Signals

Amplification of Weak Alternating Currents.—H. BARKHAUSEN.—The third installment of a series, this part dealing with the amplification and multiple amplifiers. The author discusses the efficiency of the connection of radio tubes for amplification, back-coupling circuits, limits of amplification and practical performance of vacuum tubes.—*Radio Review,* March, 1922.

High-Power Radio Station at Saïgon, Indo-China.—The great economic importance of the French colonies of Indo-China, which exported, for example, during 1919 about 3,000 tons of rubber and 950 tons of coffee, warranted a direct radio communication with the French capital. A high-power radio station was therefore erected recently and was inaugurated in the presence of Marshal Joffre at the city of Saïgon. A description of this station is given.—*Radioélectricité,* March, 1922.

Simple Generator of High-Frequency Current for Measurement Purposes.—Emphasizing the importance of high-frequency measurements in modern radio researches, the author goes on to detail the requirements of the generator of high-frequency current for this class of work and to describe apparatus which has actually been used for this purpose. Examples of the measurements that have been undertaken are also given.—*Electrician (London),* April 14, 1922.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Indianapolis Seeks Lower Electric Rates

THE city of Indianapolis and a group of central-station customers have petitioned the Indiana Public Service Commission to rehear the complaint against the electric rates of the Indianapolis Light & Heat Company and the Merchants' Heat & Light Company and to order a further reduction. The commission issued an order in March establishing new rates for the companies, which became effective April 1. The primary domestic rate was reduced, and the commission announced that the whole effect was to put the charges considerably below the rates previously authorized.

The petitioners now say that the new rates "have resulted in a very material increase in the rates and charges for both power and light to a very large proportion of consumers in Indianapolis." Commissioner Glenn Van Auken, who had charge of the original hearing, announced that the commission will order further reductions, but that no change will be made in the larger power rates or in the primary domestic rate.

Canadians Refuse to Negotiate St. Lawrence Treaty Now

THE desire of the United States to negotiate a treaty looking to the deepening of the waterways which will enable oceangoing ships to reach the Great Lakes has been formally communicated to the Canadian government. The Canadian government, however, because of a local political situation does not consider the time opportune for negotiations on a St. Lawrence waterway and power project. Prime Minister King on Monday in bringing the matter up in the Canadian House of Commons said that the United States government had been informed of the attitude of the Canadian government. This, however, it is understood is not to be taken as a flat rejection of the proposition but only as a desire by Dominion representatives to withhold negotiations until the time is more opportune.

Upon receipt of the news in Washington there was little surprise expressed. In fact, prior to the presentation of the United States' note the feeling was freely expressed in official circles that the Canadians might not be eager to consider a treaty at this time largely because of the Montreal opposition. The Canadian government, it is known, needs the support of the Quebec representatives to carry through its program.

Secretary Hughes in his note said that "he is authorized to state that the President favors the negotiation of a treaty on the basis of this report of the International Joint Commission, or such modifications as may be agreed upon." He asked to be informed "whether the appropriate British and Canadian authorities are disposed to undertake the negotiation of a treaty."

Representative Ten Eyck of Albany, N. Y., made an extended speech in the House last week in opposition to the waterway project, in which he advocated the purchase by the United States of territory in Canada lying east and south of the line of the present center of the channel of the St. Lawrence River from its mouth to its source in order to establish American rights to develop and utilize half of the water power. Senator Calder of New York is also opposing the projected agreement vigorously.

New York State Government Contends that Federal Power Law Is Invalid

AN ATTACK upon the constitutionality of the federal water-power law—the first to be made—has just been launched by the State of New York, which has prepared, through its Attorney-General, a motion asking the United States Supreme Court to permit it to bring an original bill to test the law. The motion probably will be filed as soon as the court reconvenes.

The bill also will ask the court to enjoin the Secretaries of War, the Interior and Agriculture, constituting the Federal Power Commission, and the United States Attorney-General, as the law officer of the government, from enforcing the provisions of the act within the State of New York.

Conceding that the federal government has constitutional jurisdiction over navigable waters for the specific purpose of navigation, New York, in its motion, asserts that the federal water-power act will interfere with its rights and duties, as well as those of its citizens, and that "there exists the intent on the part of said, defendants [the federal officials] wrongfully to so construe and hurtfully enforce and administer said act" as to extend its provisions "to water powers on practically all streams in the state, large and small, except brooklets." The powers which the federal government proposes to exercise under the act, the state contends, are not required for purposes of navigation.

The formal motion presents in detail the various grounds which the state desires to urge in opposition to the federal statute. Some of those who have examined the motion and are familiar with the practice of the court are said to have predicted that it will be granted and that oral argument in the case will be heard early in the term beginning next October.

Child Labor Law Found Unconstitutional by Supreme Court

BY A UNANIMOUS decision the United States Supreme Court last week held the child labor tax imposed by Congress in the revenue law of 1918 to be unconstitutional as being an attempt by imposition of an excessive tax to regulate employment within the states, which the court held to be a matter for state control. The opinion was read by Chief Justice Taft. This is the second time that the Supreme Court has declared unconstitutional congressional legislation seeking to regulate the employment of child labor.

Electric Light and Power Rates Equalized in Los Angeles

AS A LOGICAL sequel to the absorption of the Southern California Edison Company's distribution system by the city of Los Angeles, the municipal authorities have lowered the electric light and power rates of the 120,000 consumers taken over by the city so as to conform with the municipal rate of the city's Bureau of Light and Power and make the rates alike all over the city. It was explained that the reduction in the rates paid by these former Edison consumers will result in a direct saving to them of approximately $50,000 per month, or $600,000 annually.

William Baurhyte, vice-president of the Los Angeles Gas & Electric Corporation, is quoted as saying that his company is prepared to meet any such change which the city may make, provided that it meets with the approval of the State Railroad Commission, and that his company will apply immediately to the State Railroad Commission for permission to make such equalization.

Bituminous Coal Output Increases

SPURRED to increased activity by the necessity of keeping the fast-dwindling reserve stocks of bituminous coal from reaching the danger mark of 25,000,000 tons, the non-union soft-coal mines produced 5,000,000 tons in the week ended May 27, the eighth week of the strike. This is an increase of more than 500,000 tons over the preceding week.

Administration officials are withholding comment on the situation because they are trying to avoid buyers' panics, but it is generally recognized in Washington that sooner or later the conditions will be such that, unless the unexpected happens, outside influence must be exerted in an effort to effect an end of the strike.

La Follette Prints Charges Against General Electric in "Record"

SENATOR LA FOLLETTE of Wisconsin last week in the Upper House had the secretary of that body read a long letter received by the Senator from Samuel Untermyer of New York, counsel for the Lockwood legislative investigating committee, and copies of two letters addressed by Mr. Untermyer to the Attorney-General of the United States. These letters, which thus became part of the *Congressional Record*, made charges against the General Electric Company of which the essence was that this company was violating in four particulars a decree issued against it in June, 1911, in favor of the federal government. The four particulars in which this decree was alleged to be violated were thus specified:

1. Operating companies controlled by the General Electric Company under their original names without announcing that company's interest or control.
2. Distributing lamps under agency or consignment agreements which are a cover for price fixing.
3. Acquiring the Franklin Electric Company.
4. Discriminating against dealers who failed to maintain the price-fixing program.

The letters addressed to the Attorney-General, dated in March, urged the prosecution of the General Electric Company by the federal officers of the New York district. Senator La Follette, in bringing to the attention of the Senate the fact that no action in compliance with this request had been taken by the Attorney-General, alluded to the General Electric Company as "one of the most oppressive monopolies in the country."

Proposed Lamp Tariff Brings Lively Senate Debate

THE 70 per cent ad valorem duty on incandescent lamps prescribed by the finance committee of the United States Senate was reduced to 45 per cent at the Wednesday night session, when the upper house adopted by 31 to 30 an amendment proposed by Senator Jones of New Mexico. An amendment to reduce the rate to 40 per cent was lost by only three votes. The discussion of the item led to an attack on the General Electric Company by Democratic senators, at which time a letter to Senator La Follette from Samuel Untermyer, counsel for the Lockwood housing committee of New York State, which investigated the General Electric's part in the lamp market, was the focal point in the debate. Seven Republicans voted for the 45 per cent rate.

The Senate has adopted the duty in paragraph 320 of the tariff bill covering electric storage batteries and parts, plates and plate materials wholly or partly manufactured. On motion of Senator McCumber of North Dakota the rate of 45 per cent ad valorem, as originally recommended by the finance committee, was reduced to 40 per cent and adopted. Senator McCumber explained that the duty on storage batteries should be as high as the duty on lead as lead constitutes 90 per cent of a battery. An amendment by Senator Simmons of North Carolina reducing the duty to 15 per cent was rejected.

House and Senate Are Likely to Become Deadlocked on Muscle Shoals

INVESTIGATIONS and negotiations in regard to the government's nitrate and power projects at Muscle Shoals, Ala., continued in Washington during the week. The House committee on military affairs rejected the bids of Henry Ford, the Alabama Power Company, Frederick E. Engstrum and others. The committee designed a set of specifications of its own, based on the Ford offer, first eliminating from any consideration whatever the government's interest in the steam plant at Gorgas, Ala., on the Warrior River, which the Alabama Power Company has a contract to buy and to purchase which it is in negotiation with the Secretary of War. The committee inserted in its specifications a clause guaranteeing the manufacture of fertilizer which is of the most cast-iron character. As this is telegraphed from Washington the representatives neither of Mr. Ford nor of the Alabama Power Company nor of others have made any counter offer to the committee based on the new specifications.

According to a ruling of Attorney-General Daugherty made last week, neither the Alabama Power Company nor the Air Nitrates Corporation has any prior right to purchase from the government properties they had used at Muscle Shoals.

The Senate committee on agriculture and forestry had before it at the end of the week Gifford Pinchot, Secretary of War Weeks and others, to obtain addi-

tional information on Muscle Shoals. The committee's plan is to attach a rider to the army appropriation bill when it comes on the floor of the Senate for an appropriation of $7,500,000 to go on with another year's work on Wilson Dam, while the private offers for Muscle Shoals are being examined into further. Information in Washington continues to point to a deadlock between the House and the Senate on Muscle Shoals legislation at this session of Congress.

The representatives of those who have submitted bids to the government for its Muscle Shoals property were called to the offices of the committee on military affairs of the House on May 27 and to each of them was handed a communication from the chairman of the committee. Those whose offers were for only a portion of the government's holdings at Muscle Shoals received copies of the conclusions reached some weeks ago by a sub-committee of the committee. It is assumed that the full committee has adopted those conclusions as essential to any offer.

The text of the communication handed one of those whose bid was for a portion of the property only is as follows: "It is the judgment of this sub-committee that any proposition for the purchase, lease or use of the Muscle Shoals property of the government of the United States shall be based upon the following as fundamentals and essentials: First, that the property shall at all times be subject to the absolute right and control of the government for the production of nitrates or other ammunition components or munitions of war and that Nitrate Plant No. 2 must be kept available therefor by the purchasers, lessees or users of the property; second, that the purchasers, lessees or users of the property shall be obligated in the strictest terms to the manufacture and sale to the public of fertilizers in time of peace; third, that any proposal for the purchase, lease or use of the Muscle Shoals property of the United States government must be for the entire property except the so-called Gorgas plant and the transmission line therefrom."

In the case of Mr. Ford, it is understood that the committee went over his offer paragraph by paragraph, amending it in a number of important particulars. In addition to eliminating the Gorgas plant, it is understood that it was made a condition of the contract that Mr. Ford manufacture 2,000,000 tons of mixed fertilizer on which his profit was to be limited to 8 per cent. As amended by the committee, the offer is understood to provide that the operating company must be capitalized at $10,000,000, all to be paid in. The committee is understood to be willing to accept the amounts proposed by Mr. Ford for payment and to accede to his desire for a lease period of 100 years. The committee was advised unofficially on the afternoon of May 31 that Mr. Ford would not accept the offer as amended.

Utilities Commissioners to Meet at Detroit

THE annual convention of the National Association of Railway and Utilities Commissioners, composed of the members of the various state public service, railway and utility commissions and also of the Interstate Commerce Commission of the United States, will be held at Detroit, Mich., beginning Sept. 26. It is expected that, among other matters of importance, a permanent plan of co-operation between the Interstate Commerce Commission and the various state commissions, looking toward the elimination of conflicting rules and orders, will be perfected.

Abolition of the Indiana Public Service Commission Threatened

ABOLITION of the Public Service Commission of Indiana has been made one of the planks of the Republican party's platform for this fall's campaign, despite the wishes of Governor McCray. This action of the Republican state convention is regarded as an outcome of the fight launched by Mayor Lew Shank of Indianapolis against the commission. It will be remembered that Mayor Shank led a mob of Indianapolis citizens to the State House three months ago as a protest against the merger of a number of electric light and power companies.

It is understood also that the Democratic State Committee had selected the abolishment of the Public Service Commission as one of its planks, but the Republicans convened first and adopted the issue. Governor McCray, it is said by those who are familiar with the political situation, will not give up the hope of retaining the Public Service Commission, but the adherents of the Indianapolis Mayor declare that the political power of the latter is in the ascendant.

The Indiana General Assembly convenes next January, and leaders of the Shank faction of the Republican party assert that steps will be taken immediately toward pushing through the legislation they desire. Virtually every utility in Indianapolis, with the exception of the Indianapolis Street Railway Company, has failed to get along with the Mayor. The electric power merger started the agitation, which was fostered by an increase in rates granted the Indiana Bell Telephone Company, and when the Citizens' Gas Company petitioned for an advance of more than 30 per cent the Mayor became still more incensed.

Pacific Coast Section Considers Menace of Proposed California Power Act

THE opening sessions of the annual convention of the Pacific Coast Electrical Association, which is a geographic section of the National Electric Light Association, held in Los Angeles on Wednesday of this week, indicated that it would be one of the most successful meetings of that section. More than 400 were registered on the opening day, and the sessions, which were held at the Ambassador Hotel, were all well attended.

The menace of the proposed California water and power act was again emphasized by President A. B. West in his address. President-elect Frank W. Smith of the national body delivered a forceful address which brought out the need for close co-operation between all the geographic sections and the national organization.

On Wednesday afternoon parallel sessions of the Technical, Commercial and Accounting Sections were held. In the technical session committee chairmen made progress reports on inductive interference, apparatus, power factor and prime movers. These reports were discussed briefly, and concrete suggestions were made for continuing during next year the activities now under way. In the commercial session great interest was aroused in the subject of electrical heating for industries and homes and in electrical cooking. The general opinion was that, although some progress had been made in the past, these fields were hardly touched and that those engaged in the industry should as a first step adopt electrical heating and cooking themselves.

On Thursday parallel sessions were to be continued, and on Friday, following the final general business session, an industrial conference was to be held. This conference was to follow the lines laid out at the last convention, its aim being to acquaint those outside the electrical industry with its problems.

American Engineering Council's Executive Board Meets

THE licensing of engineers, national reforestation, governmental reorganization, employment service, affiliation of local organizations and the federal water-power situation were some of the questions discussed and acted upon by the executive board of the American Engineering Council at the Pittsburgh meeting which closed May 27.

Committee reports were acted upon, and President Cooley outlined definite objectives. Consolidation of the engineering and public works functions of government under a single head was advocated by the committee on public affairs. A progress report was made by the committee studying the relative merits of the two-shift and three-shift day in industry. The Engineering Society of Western Pennsylvania was host to the executive board.

Better Teaching the Slogan at Convention of the S. P. E. E.

A REALIZATION of the necessity for better teaching and closer co-operation with industry has led to the selection of these topics for the program of the annual convention of the Society for the Promotion of Engineering Education, which will be held at the University of Illinois, Urbana, June 20-23.

Prof. Charles F. Scott of Yale is president of the organization and will give the keynote address at the opening session. Prominent educators who will take part are Dr. Howe of the Case School of Applied Science, Dean Raymond of Iowa University, Dean Potter of Purdue and Professor Talbot of Illinois.

Seattle-Tacoma Project for Interchange of Hydro-Electricity

THE contemplated agreement for interchange of hydro-electric power between the cities of Seattle and Tacoma, Wash., outlined in the ELECTRICAL WORLD for April 1, has reached a more definite stage. This plan concerns surplus power generated by the Skagit River hydro-electric plant of Seattle, now under construction, and the proposed Lake Cushman hydro-electric plant of Tacoma. A 15,000-kw. tie line between the two cities, costing about $150,000, will be built. Each city will bear half of this expense. Under the proposed contract each city will be permitted to draw on the other for surplus power whenever any is available. The price is to be ½ cent per kilowatt-hour for hydro-electric energy and 1½ cents per kilowatt-hour for energy generated by steam.

At present Seattle buys power for the operation of its municipal railway system from the Puget Sound Power & Light Company, and Tacoma buys power from the same company whenever the demand for power exceeds the capacity of the municipal plant.

Receivership of Memphis Gas & Electric Company May End July 15

RECEIVERS of the Memphis Gas & Electric Company are, it is said, laying plans to end the receivership of the company about July 15, following reorganization. The attorney for the company announces that its properties will be advertised for sale for thirty days. The Public Utilities Commission of Tennessee has before it a petition from the city of Memphis asking for a reduction in gas and electric rates. The hearing will come up June 1. Under a ruling made by the commission when the company was allowed to raise rates reductions must be made when the company's surplus exceeds $50,000. An excess above that figure has been reached.

Salt Lake City Plans Electric Show

PREPARATIONS are now under way for a big electrical exposition to be held in Salt Lake City, Oct. 2 to 14. The Rocky Mountain Electrical Co-operative League is taking the initiative, and Col. A. M. Jackson, local representative of the Locke Corporation, has been made chairman of a committee to further the project. All electrical interests as well as business institutions in general are giving the movement their enthusiastic support. W. D'Arcy Ryan will have charge of the spectacular illumination, and it is expected that the exposition will be the greatest held in the West.

Terms and Service to Determine Radio Outlet Discussed

THE largest gathering of jobbers and manufacturers' representatives that ever attended a convention of the Electrical Supply Jobbers' Association assembled last week in Hot Springs, Va. Monday and Tuesday were devoted to meetings of the executive committee, Wednesday and Friday morning to group meetings of the Atlantic and Central Divisions and executive sessions of the full association, and Thursday to open meetings addressed by distinguished guests.

Milan R. Bump, president of the National Electric Light Association, discussed the co-operative movement for business development now in operation under the guidance of the joint committee representing all branches of the industry, pointing out the jobber's part in the project. William E. Robertson of Buffalo, who represents the jobbers on the N. E. L. A. executive committee, said that there was no reason why 1922 cannot be made the greatest year in the jobbers' history if each one will undertake to make conditions in his own locality right by tying all the electrical interests of his community into this movement.

Dr. Frank B. Jewett, vice-president of the Western Electric Company and president of the American Institute of Electrical Engineers, gave an illustrated lecture on the development of radio, in which he dwelt on its distinct place in the economic situation. The element of fad, he said, will wear off and popular attention and appreciation will center on the service which radio can render. It is these fundamental factors that must be counted upon for the permanent business.

David Saranoff, general manager of the Radio Corporation of America, told the romantic story of the evolution of broadcasting and the radio market to the

present unmeetable demand. More than ten thousand applications, he said, have been received from concerns and individuals who wish to become distributers for the Radio Corporation, and as many as ten thousand letters, a thousand telegrams and a thousand visits have been received in a single day from persons desiring information or apparatus. The mail at present averages five thousand letters a day. Mr. Saranoff discussed the problems of broadcasting and stated that the most practical range is a hundred miles, which would require about a hundred broadcasting stations to serve the entire country. He expects to see about twelve stations in operation by the end of the year.

T. E. Berger, secretary of the Society for Electrical Development, read a paper analyzing the present set-up in the system of distributing electrical supplies and pointing out the need for definite readjustments.

H. F. Thomas, St. Paul, chairman committee on accounting and statistics, presented a final, complete report embracing a year's survey of the cost of operating five jobbing houses. The first six months' report appeared in the ELECTRICAL WORLD for March 25, page 577. The full year's statistics will be published in an early issue.

F. D. Van Winkle, Cincinnati, chairman committee on moving pictures, reported the completion of a scenario to be used by jobbers to carry to the electrical contractor and dealer the message of "Sell 'Em Something More" along the lines of the successful "Ask 'Em to Buy" movement of the automotive accessory industry. It will be ready for action at the next meeting.

Frederick Rost, Newark, presented for consideration a code of ethics which had been developed by a special committee for the jobbing industry. This code will be voted on at the next meeting.

J. G. Johannesen, Baltimore, was elected chairman of the Atlantic Division and L. V. Garron, Philadelphia, and Bruce Wetmore members of the executive committee. W. R. Herstein, Memphis, was re-elected chairman of the Central Division, and F. W. Van Winkle, Cincinnati, and H. F. Thomas, St. Paul, were again made members of the executive committee. F. M. Bernardin, Kansas City, was re-elected executive committeeman-at-large for the Central Division. F. S. Price, Boston, and W. E. Roberson, Buffalo, were appointed to serve on the joint committee of the industry which is being organized by the Society for Electrical Development to deal with the duplication of effort.

College Deans Favor Five-Year Course for Engineering Students

AT A CONFERENCE held recently in Chicago by fourteen representatives of engineering colleges in the Middle West, all but two of whom are the deans of their respective institutions, an optional five-year engineering course was favored in the following terms:

Resolved, That in order to meet the constantly enlarging responsibilities of the engineering profession we favor an advance in engineering education at this time that shall provide for five years of collegiate training for those engineering students whose aim is to be qualified to take positions among the creative leaders in the profession, and that such advance shall be made in substantial accordance with the following plans:

1. Remodel the present four-year engineering curriculum, substituting a substantial proportion of humanistic and fundamental subjects in place of an equivalent amount of advanced technical work. It is desirable that so far as possible the curriculums in the different branches of engineering shall be sufficiently uniform to permit students to defer their final choice of a specialty at least to the end of the second year.

2. Add a fifth year of advanced work, mostly or wholly technical and specialized to such an extent as desired.

3. The first four years of work shall lead to a bachelor's degree and the fifth year to an advanced degree in engineering.

The members of the conference agreed to present these recommendations to the authorities of their respective institutions and to report back at a second session to be held at Urbana, Ill., during the week of June 18. The institutions represented were the State University of Iowa, University of Minnesota, Ohio State University, Purdue University, University of Michigan, Michigan Agricultural College, University of Illinois, Northwestern University, University of Wisconsin, University of North Dakota, University of Nebraska, Iowa State College, Washington University and the University of Colorado.

Utilities' Credit Must Not Be Impaired, Says Large Investment Banker

BECAUSE the utilities must seek additional capital from year to year, it is of extreme importance that they preserve their credit on a high plane, declared A. G. Hoyt, vice-president of the National City Company, before the one-day convention of the Metropolitan New York Section of the N. E. L. A. on May 26. This meeting was held in order that the employees of the different light and power companies operating in Greater New York might have the opportunity to take up and review briefly the work and reports of the Commercial, Accounting and Technical Sections of the national association for the year just closed. Pointing out that if a utility cannot finance expenditures for additional plant and extensions, it will be unable to meet the demand for service, Mr. Hoyt continued:

"Credit is a very elusive thing, and it is not always easy for a company to keep its credit unimpaired. In this connection the financial structure of a company is very important. It should have a well-balanced, conservative capitalization. The bonded debt should not exceed 60 per cent to 70 per cent of the investment value of the company. It should have a flexible mortgage which will permit it to issue from time to time additional bonds. The bonds issued, however, should not exceed 75 per cent of the amount of the added property, and fixed charges should not be increased to a point where they are much over 50 per cent of net earnings. The company should sell additional stock to supplement its bond financing.

"No company can successfully finance itself continuously from year to year by selling bonds or obligations bearing fixed charges. The time will come when the equity which is represented by the stock will bear too small a relation to the bonded debt. The property, which may have been bonded originally for from 50 to 60 per cent of its value, will with continuous issues of obligations come to be bonded for 80 or 90 per cent of its value. Under such conditions the company's credit becomes adversely affected and the investing public will properly refuse to buy more of its bonds. The sale of stock from time to time will tend to keep a proper balance between investment and bonds."

Program for Spring Lake Convention of Supply Manufacturers

ARRANGEMENTS for the annual meeting as well as the section meetings of the Associated Manufacturers of Electrical Supplies, to be held at the Essex and Sussex Hotel, Spring Lake, N. J., during the week commencing June 19, are progressing favorably and a large attendance is assured. In addition to the annual meeting of the association, all the sections will also hold their annual meetings, at which officers will be elected for the coming year.

A feature of the meetings this year will be a special general meeting for all members, in addition to the annual meeting, for the discussion of all matters of common interest, whether technical or otherwise.

At the meeting of the general standards committee on Monday, June 19, there will be presented for final adoption some eight or ten standards covering electrical devices which have received the approval of the membership. The schedule of meetings follows:

Monday, June 19.—General standards committee.

Tuesday, June 20.—Signaling Apparatus Section, Heating Appliance Section, Panelboard and Switchboard Section (two days), Snap Switch Section, Lamp Receptacle and Socket Section, Attachment Plug Section, Armored Conductor Section, Non-Metallic Conduit Section, Rigid Conduit Section, Metal Molding Section.

Wednesday, June 21.—Knife and Inclosed Switch Section, Outlet Box Section, Air-Circuit-Breaker Section, Industrial Lighting Section, Electrical Porcelain Section, Radio Apparatus Section, Molded or Formed Insulation Section, magnet wire group, Wire and Cable Section.

Thursday, June 22.— (Morning) Fuse Section, Line Material Section, Laminated Phenolic Condensation Products Section, Carbon Section; (afternoon) annual meeting of the association, meeting of board of governors; (evening) informal dinner dance.

Friday, June 23.—General meeting of common interest.

May Financing Reaches the Highest Total of the Year

DURING the month of May stocks and bonds amounting to $69,344,560 were reported as offered to investors by the electric light and power public utilities. This figure, the highest total reached this year, represents an increase of more than $26,000,000 over April, 1922, and more than $13,000,000 over May of last year. An interesting feature of the month's flotation is the New Bedford Gas & Electric Light Company issue, a 5 per cent bond at a 3.29 premium. While the average yield for May, 6.74, is slightly higher than that for April, four issues—those of the Lehigh Navigation Electric Company, the Philadelphia Electric Company, the New Bedford Gas & Edison Light Company and the Utah Light & Traction Company—yielded the investor a rate of return less than 6 per cent. The number of separate issues was large and long-term securities continue to predominate. The issue of the Commonwealth Power Corporation—$12,500,000—constitutes the largest single offering.

Name of Company	Amount of Issue	Period	Class of Security	Purpose of Issue	Rate of Interest	Offered at	Per Cent Yield
Continental Gas & Electric Corp. (Ohio)	$1,500,000	Twenty-five-year	Refunding mortgage bonds, series A	To provide funds for acquisition of new properties and for extensions to existing properties	6	93	6.55
Houston Lighting & Power Co. (Texas)	500,000		Cumulative preferred stock		7	94* or 95†	7.44
Lehigh Navigation Electric Co. (Pa.)	3,000,000	Twenty-one-year	First (closed) mortgage gold sinking-fund bonds, series A		6	102	5.83
Utilities Power & Light Co.	600,000	Fifteen-year	Secured sinking-fund gold bonds		7	95½	7.50
Philadelphia Electric Co	7,500,000	Twenty-five-year	First lien and refunding mortgage gold bonds		5	99½	5.53
Great Western Power Co. of California	2,000,000	Thirty-year	First and refunding mortgage bonds, series C		6	100	6
Metropolitan Edison Co. (Pa.)	1,805,760		Cumulative participating preferred stock		7	96	7.29
Western States Gas & Electric Co. of California	500,000	Ten-year	Gold notes of 1917 (secured)		6	96½	6.88
Northern Indiana Gas & Electric Co.	7,000,000	Thirty-year	First lien and refunding mortgage gold bonds, series May, 1922	To purchase and cancel or pledge under this mortgage certain underlying bond issues, to pay existing floating debt and for additions and betterments	6	95	6.37
West Virginia Water & Electric Co.	3,300,000	Twenty-year	First mortgage gold bonds		6½	100	6.50
New Bedford Gas & Edison Light Co. (Mass.)	1,500,000	Sixteen-year	First mortgage gold bonds of 1918, series D		5	103.29	4.70
Utah Power & Light Co.	5,000,000	One-hundred-year	Gold debenture bonds, series A	To provide funds for retirement of floating debt and for other corporate purposes	6	91	6.60
East Kootenay Power Co., Ltd. (Can.)	2,000,000	Twenty-year	First mortgage sinking-fund gold bonds		7	97½	7.25
Commonwealth Power Corp.	12,500,000	Twenty-five-year	Secured sinking-fund gold bonds	To be applied to payment of debt due and bonds due	6	90	6.85
Penn Central Power Co.	3,350,000	Forty-year	First mortgage sinking-fund gold bonds, series A	To provide funds for additions	6	99½	6†
Northern New York Utilities, Inc.	1,322,800	Twenty-five-year	First and refunding bonds, series B	To reimburse treasury for past expenditures and to provide money for additions	6	100	6
Utah Light & Traction Co.	12,471,000	Twenty-two-year	First and refunding mortgage gold bonds, series A		5	91	5.70
Philadelphia Suburban Gas & Electric Co.	700,000	Fifty-year	General mortgage gold bonds	To provide funds for general corporate purposes	6	95	6.35
Mississippi Valley Power Co.	400,000	Twenty-five-year	First mortgage gold bonds, series A		6	91	6.75
Rockingham County Light & Power Co. (New Hampshire)	$650,000	Fourteen-year	(Closed) mortgage gold bonds		5	90	6.05
Coast Valleys Gas & Electric Co.	400,000	Thirty-year	First mortgage bonds	To redeem notes falling due and to reimburse treasury for part of the cost of recent extensions and betterments	6	96½	6.25
Lake Superior District Power Co.	1,345,000	Twenty-year	First mortgage and refunding gold bonds, series A		6½	94½	7
Total	$69,344,560						

* Cash. † On installment plan.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest

Hydro-Electric Progress in Tennessee.—A development of 4,500 hp. on the Watauga River, near Johnson City, Tenn., is being undertaken by the Tennessee Eastern Electric Company, at a cost of about $300,000, and transmission lines to Johnson City and nearby points will be built.

Utilities Development Corporation Changes Name.—The name of the Utilities Development Corporation, Chicago, has been changed to Utilities Power & Light Corporation. The company owns and operates the Indiana Power Company, Vincennes, Ind., and the Interstate Power Company, Chicago.

City Commission of Jacksonville Opens Electrical Display Rooms.—The City Commission of Jacksonville, Fla., recently opened electrical display rooms containing ranges and water heaters of every description, with demonstrators to explain their operation and quote prices and terms to those desiring to cook with electricity. The opening of these display rooms is in line with the city's plan to conduct a campaign for the utilization of the full capacity of the municipal electric plant.

Vacuum Street Cleaners Advocated for New York City.—Electric vacuum cleaners may replace the army of "white wings" on New York streets. The plan is urged by the Downtown League, which has sent an appeal to the Street Cleaning Department. The league says the city will eliminate disease-bearing dust, cut the mortality list, release the "white wings" for other work and save hundreds of thousands of dollars by using the cleaners. It is claimed that a suitable motor-driven vacuum cleaner can be built at reasonable cost and operated economically.

The World's Highest-Head Plant.—What seems undoubtedly to be the highest-head hydro-electric development in the world is the reserve plant of the Société d'Electrochimie on Lake Fully, Valais, Switzerland. This plant is fed from a reservoir constructed in the Alps at a height of 5,413 ft., as compared with the 3,083 ft. of the Arly development in the Pyrenees and the 3,067 ft. of the Lake Tanay (Switzerland) plant. The Fully power house was built as an auxiliary to the larger plant of the company at Martigny, to guard against the insufficient supply of water which would otherwise be experienced in the winter time, when the maximum output of 16,000 hp. may fall to 5,000 hp., because the glaciers from which the mountain streams are fed are no longer responsive to the rays of the sun. Under the impact of the water falling more than a mile, a liter (0.035 cu.ft.) of water a second exerts a force of 16½ hp. upon the axis of the turbines at the Fully plant, which, at a turbine efficiency of 75 per cent, represents 12 kw. at the generators.

France to Adopt Electric Tram Lighting.— As an outcome of the Batignolles tunnel disaster the French government has decreed that gas lighting on trains must be abolished by the end of 1922 to do away with the menace contained in carrying cylinders of gas under pressure. In response to the government decree the first electrically lighted train between Paris and Versailles has already begun to operate with entire success, and the work of substituting electricity for gas is proceeding rapidly.

Madrid's Electrical Service to Be Improved.—The Hidroélectrica Española, the second most important hydro-electric company in Spain, has nearly completed the construction of its station at Dos Aguas, at the junction of the Jucar and Gabriel Rivers, to the southwest of Valencia. This station will give about 100 000 hp. when completed and will help to improve the inadequate light and power service of Madrid, where the demands have increased enormously in the last few years. The problem in that city, according to the *Engineer*, is very acute, and it is possible that a large steam-power station will have to be built to preserve the city from the failure of electric service that now arises from time to time when the rainfall is inadequate.

British Remove Ban on Wireless Broadcasting.—The British Postmaster-General has announced that it has been decided to permit the establishment of certain wireless-telephone broadcasting stations in the United Kingdom. It is proposed to divide the country into areas centering about London, Cardiff and Plymouth. Birmingham, Manchester, Newcastle, Aberdeen and Glasgow also are to be centers under the plan proposed. Sending stations are to be allowed in each area, with the stipulation that permits for broadcasting will be granted only to British firms which are bona-fide manufacturers of wireless apparatus. The ban of the government on all such projects heretofore has been the chief obstacle in the way of England following America's radio lead.

State Power Maps Now Available.—A new map of Virginia on a scale of one to five hundred thousand, showing the location of the power stations and transmission lines used in public service and the names of the public utility companies, has just been published by the United States Geological Survey. This map is one of the series of state power maps now being published by the Geological Survey. Maps have already been completed of New York, Pennsylvania, Massachusetts, Rhode Island, Connecticut, Maryland, Delaware, District of Columbia, Vermont, New Hampshire and New Jersey, and maps of Indiana, Maine and West Virginia are being prepared for publication. The maps that are available for distribution may be purchased from the director of the United States Geological Survey for 50 cents a copy.

Rate Readjustment for Oklahoma Utility.—Further revision of electric rates of the Minnesota Electric Light & Power Company, which has a generating plant at Cushing, has been made by the Oklahoma Corporation Commission. A short time ago the rates were reduced from 14 cents to 12 cents for the first 30 kw.-hr., and at the same time the rate-making valuation was also lowered. After the rehearing, at which readjustments were requested, slight changes were obtained. The basic rate, however, is still 12 cents, but it applies to the first 100 kw.-hr. instead of the first 30-kw.-hr.

Northern Indiana's Financial Plans.—The Indiana Public Service Commission has authorized the Northern Indiana Gas & Electric Company to issue and sell approximately $24,000,000 in bonds and stock for the reorganization of its financial structure and improving its financial condition so as to provide funds for needed additions and extensions of its properties. The new issues are to be used for retiring outstanding securities. The issues ordered include $5,000,000 common stock to be sold at not less than par, $9,000,000 preferred stock at not less than par, $5,970,000 in 6 per cent gold bonds, $1,030,000 in 6 per cent mortgage bonds for pending improvements and $1,885,000 in 5 per cent mortgage bonds for improvements since Dec. 1, 1918. The old bond issue is to cover securities affecting the South Shore Gas & Electric Company, Hammond, Whiting, East Chicago, Indiana Harbor and Michigan City utilities.

Coming Meetings of Electrical and Other Technical Societies

American Association of Engineers—Salt Lake City, June 5-7.
Electric Power Club—Hot Springs, Va., June 5-7.
American Society Heating and Ventilating Engineers—Buffalo and Detroit, June 6-10.
N. E. L. A. Geographic Divisions—Northwestern, Boise, June 7-10; North Central, St. Paul, June 13-15; Iowa Section, Lake Okoboji, June 20-22; New England, New London, Conn., Sept. 5-7.
Canadian Electrical Association—Ottawa, Ont., June 15-17.
Associated Manufacturers of Electrical Supplies—Spring Lake Beach, N. J., June 19-25.
Society for the Promotion of Engineering Education—Urbana, Ill., June 20-23.
American Society of Civil Engineers—Portsmouth, N. H., June 21-22.
American Association for the Advancement of Science—Salt Lake City, June 22-24.
American Physical Society, Pacific Coast Section—Salt Lake City, June 22-24.
Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 22-24.
A. I. E. E. Annual Convention—Niagara Falls, Ontario, June 26-30. (For program see issue of May 13, page 968.)
American Society for Testing Materials—Atlantic City, N. J., June 26-July 1.
National Council Lighting Fixture Manufacturers—Cleveland, June 28-29.
Ohio Electric Light Association—Cedar Point, Ohio, July 11-14. (For program see issue of May 13, page 972.)
A. I. E. E., Pacific Coast Convention—Vancouver, B. C.—Aug. 8-11.
International Association of Municipal Electricians — New Bedford, Mass. Aug. 22-25.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

The Public and the Service Charge.—While ordering, in deference to public opposition, the discontinuance of a service charge made by the Lansing Fuel & Gas Company, the Michigan Public Utilities Commission said: "In doing this it must be understood that this commission is not surrendering its convictions that a service charge comes nearer to doing exact justice to the gas users than the flat rate does. One great trouble has been that the public has not fully understood just what this service charge means. Some have had the impression, and probably have it yet, that this is a charge which the gas company makes for reading the meter. Some have the impression that it is a rental of the meter. Others have the impression that on removing the service charge the rate of $1.25 per 1,000 cu.ft. will remain. These are erroneous ideas. We are of the opinion that when the public comes to understand what this readiness-to-serve charge really is there will be a demand for it."

Valuation Dicta of the California Commission.—In its order reducing the rates of the San Joaquin Light & Power Corporation (see ELECTRICAL WORLD, May 6, page 894), the California Railroad Commission laid down a number of rulings on fundamental questions related to regulation. The "present value" theory as a basis for rate making was rejected as unduly advantageous to the company. The theory was declared to be unfair to the consumers on a rising market and unfair to the utility on a falling market, and the commission's method, taking the reasonable costs at the time of construction, regardless of whether the cost to reproduce the properties now would be higher or lower, was declared to be sound. A claim of "cost to reproduce" was disallowed, the commission asserting that the cost to reproduce a given amount of business could not be computed simply by taking the deficit below a full return upon the investment in the past six years of more or less abnormal business, especially as these six years could not properly be considered as being within a development period. Water-right values were excluded as based on mere hypotheses, and federal income taxes were declared not an operating expense. In refusing to allow an arbitrary percentage return over the cost of money to the company the commission said: "Were financial conditions that existed at the time of the hearing to continue, there might be some justification for allowing an 8.5 per cent return to this company, which would be about 1.2 per cent more than the cost of bond money. It is, however, unfair in a decision of this character to recognize the high interest rate paid on bonds, when as a matter of fact some of those bonds are now being called for redemption and others should be, if interest rates continue to decline. . . . The company's system, though not overdeveloped, has possibilities of reducing costs due to the general tendency to reduced costs of operation and a greater concentration of business on its system. The economic depression prevailing all over the country during the past year and affecting the territory served by San Joaquin company, although now showing indications of recovery, justifies a temporary sacrifice of a portion of the full return."

Rate Increase Follows Threat to Discontinue Service.—A rate increase from 10 cents to 14 cents a kilowatt-hour has been placed in effect in Ridgeway, Ohio, by the Mount Victory Light & Power Company, following approval of its application to the Public Utilities Commission. The case was vigorously fought before the commission, but weight was given the power company's application by the fact that the village owes more than $1,500 for street lighting for which, it was said, no promise to pay had been forthcoming. Street-lighting service was discontinued several months ago when the bill reached such a figure that the company declined further credit. Demand was then made by the company that the village pay the bill immediately under threat to discontinue service to domestic consumers. When the village failed to comply with the demand, the company filed application with the utilities commission for leave to discontinue all service. The commission refused to grant authority for discontinuance of service, but indicated approval of increased rates.

Service Charge Authorized in Massachusetts.—Graduated service charges combined with reduced rates for energy have been approved for the Malden Electric Company and the Suburban Gas & Electric Company of Revere by the Massachusetts Department of Public Utilities. The Malden company's general lighting schedule was formerly 11 cents per kilowatt-hour with a minimum charge of $9 per year. The company proposed to substitute a base service charge of 35 cents per month and an energy rate of 9 cents per kilowatt-hour. This would eliminate the minimum monthly charge. The department established a service charge of 35 cents per month for a customer using a 5, 10 or 15-amp. meter, and this is gradually increased to 85 cents for a 600-amp. or 1,200-amp. meter, with other charges in proportion. Similar service charges and a 9-cent energy rate were authorized for the Suburban company, but as it serves a beach resort where there are many summer customers, it is provided that if service is not used for five successive months, there may be a minimum charge not exceeding $5.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Liability of Company for Damage from Wire Owned by Another.—Fiquett vs. Wade Electric Light & Power Company was a suit to recover the value of a mule killed by a wire erected by the owner of a planing mill for the transmission of electrical energy furnished, not in the regular course of business but under a special understanding, by the defendant company. The Supreme Court of Alabama has found the Wade company liable, despite an alleged agreement on the part of the owner of the wire to maintain it in good order. (91 So. 357.)*

Agreement Under Workmen's Compensation Act Cannot Be Collaterally Attacked.—In Smith vs. Port Huron Gas & Electric Company the plaintiff, an electrician who had been injured by contact with a switch, elected to receive compensation under the workmen's compensation act from the industrial concern for which he worked. Subsequently, claiming that his signature to the agreement had been obtained fraudulently, he brought suit against the central-station company as the wrongdoer that caused his injury. The Supreme Court of Michigan holds that under the circumstances cited such an action cannot be brought by the workman but only by his employer, although the agreement alleged to be fraudulent may be impeached by a direct proceeding in equity. (187 N. W. 292.)

Death from Electricity Transmitted for Household Lighting Puts Burden on Company to Prove Itself Not Negligent.—In Stark vs. Badger Public Service Company, an action for damages because of a death caused by electrocution from the socket of an electric lamp in the basement of a residence supplied with electricity upon a secondary wire ordinarily carrying 110 volts, proof that deceased stood in a place where contact with this voltage would not ordinarily result in death or serious injury, and that there was an opportunity for the 2,300-volt primary wires to touch the secondary wires, owing to the power company's negligence in not making seasonable repairs, was held by the Supreme Court of Wisconsin to establish defendant's liability under the doctrine of *res ipsa loquitur* ("the thing speaks for itself"), in the absence of proof that defendant was not negligent, the burden in such case being on the power company to prove itself not negligent. (187 N. W. 651.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

R. S. Reading has been appointed chief engineer of the Southwestern Gas & Electric Company. Mr. Reading

R. S. READING

comes to his new position after several years of experience in the operation of Southern public utilities. He was born in Richmond, Tex., and was graduated from the Texas Agricultural and Mechanical College as an electrical engineer in 1910. Immediately upon graduation he became associated with the Otis Elevator Company and later became service agent for the Southwestern district of that company, this leading up to his employment with the Stone & Webster Company at El Paso, Tex., in 1916. In 1918 he became power-plant electrician with the El Paso Electric Railway Company, and later was engineer in charge of electrical construction for Stone & Webster at Houston, Galveston, Beaumont and Port Arthur, Tex. In June, 1920, he was appointed electrical engineer with the Galveston & Houston Electric Railway Company, Galveston Electric Company and the Houston Electric Company. In February of this year he was appointed engineer in charge of the engineering department of the Southwestern Gas & Electric Company, with headquarters at Texarkana, Tex.

Erlon V. Crimmin, electrical engineer of the Lowell (Mass.) Electric Light Corporation, has resigned and will join the technical department of the Edison Electric Illuminating Company of Boston.

James C. Webster has become connected with the Canadian National Carbon Company, Ltd., Toronto, as brush engineer. He was formerly with the National Carbon Company, Inc.

Fred. W. Brownell, formerly general accountant for Stone & Webster, Inc., has been appointed comptroller of the Puget Sound Power & Light Company and subsidiary companies.

Waldo M. Plaisted has been appointed superintendent of the Waterbury division of the Connecticut Light & Power Company. Mr. Plaisted is a graduate of the engineering course of the General Electric Company.

Herman J. Pettengill, Jr., sales manager of the Blackstone Valley Gas & Electric Company, Pawtucket, R. I., and the Pawtucket Gas Company, has been transferred to the Boston office of the Stone & Webster Company and will be with the securities department.

Thomas D. Hawkes, treasurer of the Great Northern Power Company, has been appointed general manager, succeeding W. N. Ryerson. Mr. Hawkes has been connected with this company since its organization and has taken an active part in the management of its affairs. He will continue as treasurer and have charge of the company's finances as well as being in direct charge of the management.

W. M. Carpenter has been appointed engineer for the Empire State Gas and Electric Association. Mr. Carpenter has been associated for the past five years with the Utilities Mutual Insurance Company. He was graduated from Columbia University in 1909 and previous to his connection with the Utilities Mutual Insurance Company served as engineer for the New York Municipal Railway, the Chicago Traction Commission and the Charleston (W. Va.) Interurban Railroad.

W. W. Schwarting has been appointed general superintendent of the Hibbing (Minn.) Water & Light System, vice Charles Foster, resigned. Mr. Schwarting was graduated from Iowa State College in electrical engineering in 1905. Upon graduation he became associated with the Westinghouse Electric & Manufacturing Company until 1910, when he was employed by the People's Power Company as assistant to the general superintendent, in charge of central-power-station and gas-works operation. In 1913 he was promoted to be superintendent of power-plant construction in the same company, and four years later he was appointed general superintendent of the People's Gas & Electric Company, Mason City, Iowa. In 1920 he again entered the employ of the Westinghouse Electric & Manufacturing Company as sales engineer in the Minneapolis district, which position he held until his present appointment.

W. D. A. Peaslee has been appointed chief engineer of the Belden Manufacturing Company of Chicago.

Clarence G. Spencer, recently on the consulting board of the American Sugar Refining Company, is now connected with McClellan & Junkersfeld, Inc., of New York City.

Carl C. Long, until recently electrical engineer of Riegos y Fuerza del Ebro, Barcelona, Spain, is now in the engineering department of the Southern California Edison Company.

Charles Heston Peirson, formerly advertising agent, is now supervisor of public information for the Southern California Edison Company. Mr. Peirson has been with the Edison company for thirteen years. He has had a long experience as a writer and since entering the electrical business has prepared many articles of general interest to the industry. In addition to his regular duties, he has found time for special work on numerous committees and at the present time is chairman of the publicity committee of the Pacific Coast Electrical Association.

E. D. Bell was elected president of the Middle West Division of the N. E. L. A. at the Kansas City meeting last April. Mr. Bell is the general manager of the St. Louis Electrical Terminal Railway Company and is also in charge of properties of the Illinois Traction System, including the Madison County Light & Power Company and the St. Louis Electrical Bridge Company. After graduation from the Engineering College of the University of Illinois in 1901, he took charge of the light and power company in Urbana. In 1903 he joined the staff of the Illinois Traction System and was first stationed at Danville, Ill. He remained there a year and was then transferred to St. Louis,

E. D. BELL

where he has been stationed ever since. Mr. Bell has been actively engaged with the association work of the Missouri Association of Public Utilities, which included the organization and direction of the Missouri Committee on Public Utility Information.

F. E. Wilcox has resigned as president and general manager of the D. Wilcox Manufacturing Company, Mechanicsburg, Pa.

J. H. Shahan has been appointed sales representative in the Southern territory for the Diehl Manufacturing Company, Elizabeth, N. J. Mr. Shahan has established headquarters at 45-A Trinity Avenue, Atlanta, Ga.

C. C. Eagle, Jr., has been placed in charge of the newly established branch office of the Bristol Company, instrument manufacturer, Waterbury, Conn. Mr. Eagle was formerly in charge of the Detroit office of the company and has had wide experience in the instrument field both in the production and sales departments.

E. P. Waller has recently been appointed manager of the railway department of the General Electric Company. He has been assistant manager of this department since 1912. J. G. Barry, who has heretofore held both the position of general sales manager of the company and that of manager of the railway department, will devote his entire time and attention to the work of the sales managership. Mr. Waller was born in Martinsville, Va., and was graduated from the Virginia Polytechnic Institute in the class of 1900. Following his graduation he entered the testing department of the General Electric Company at its Schenectady works. After two years in the testing department he joined the staff of the publication bureau, assisting in writing and editing bulletins, instruction books, technical letters, etc. When the *General Electric Review* was instituted he became associate editor, M. P. Rice being editor. In the fall of 1903 Mr. Waller took up commercial railway work under Mr.

E. P. WALLER

Barry, and in 1912 was made assistant manager of the railway department. Mr. Waller has for many years been an active factor in the committee work of the American Electric Railway Association. He is a member of the Engineers' Club of New York.

L. E. Hickok has been elected general manager of the D. Wilcox Manufacturing Company, Mechanicsburg, Pa.

S. F. Hauck has assumed the duties of chief executive of the D. Wilcox Manufacturing Company, following the resignation of F. E. Wilcox as president and general manager.

E. Zinsmeyer, the new president of the Electrical Warehouse, Inc., Detroit, brings to this position years of experience gained in the electrical merchandising field. In 1900 Mr. Zinsmeyer joined the Frank Adam Electric Company at St. Louis and served successively as timekeeper, cost clerk, draftsman, salesman and sales manager. In 1920 he moved to San Antonio, Tex., as secretary and manager of the Martin Wright Electric Company. October of the same year saw his return to the North, where he accepted the position of sales manager of the Electrical Warehouse. He remained in this capacity until his recent election to the presidency of the company.

George Baily, assistant to the manager of the supply department of the Westinghouse Electric & Manufacturing Company, has been appointed supervisor of distributing agents of that company. Mr. Baily was graduated from Lehigh University in 1904 and at that time entered the employ of the Dravo Construction Company of Pittsburgh. Six years later he entered business for himself in Cincinnati as sales agent and contracting engineer. In 1913 he entered the employ of the Westinghouse company as manager of the supply division of the Cincinnati office, remaining there until 1917, when he joined the engineer officers' training camp. Mr. Baily was mustered out of the army with the rank of major and returned to the Westinghouse company as manager of the supply division of the Cincinnati office. In 1920 he was made assistant to the

GEORGE BAILY

manager of the supply department, the position he held at the time of his present appointment.

Obituary

F. L. Blaschke, who had been connected with the National Lamps Works of the General Electric Company at Cleveland for ten years, died May 26. He was a graduate of Purdue University and joined the engineering department of the General Electric Company in 1911. Subsequently he was connected with the "Mazda" service bureau on the Pacific Coast and later with the publicity department as editor of *Stimulator* and in charge of "Ivanhoe Regent" advertising.

Antoine Bournonville, for years identified with the activities of the Electrical Credit Association of the Middle and Southern Atlantic States, died during the last week in April at the Marlborough-Blenheim, Atlantic City. Mr. Bournonville was a charter member of the Electrical Credit Association and had served as president, vice-president and member of the board of directors.

Clifford Dudley Babcock, inventor, died in New York on May 22, at the age of fifty-six. Mr. Babcock was connected with the electrical industry from 1887 and was one of the pioneers in wireless. He collaborated with Lee De Forest on preliminary work on the audion. Mr. Babcock took out many patents for radio inventions, one of the latest of which covered the annular arrangement of the elements. Mr. Babcock served with the Ordnance Department of the army during the war.

Curtis E. Vandel, credit manager of the Kansas City branch of the Western Electric Company, died in that city recently at the age of forty-nine. Mr. Vandel had held the position of credit manager for the Western Electric Company in Kansas City for the past nine years and was well known in the electrical credit world, having been active in the affairs of the Electrical Credit Association. He was born in Princeton, Mo., in 1872 and was educated in the public schools there and at the Stanberry Normal School, Stanberry, Mo. in 1898 he went to Kansas City, where he was connected in succession with several mercantile establishments. In 1912 he went to the Western Electric Company and remained there as credit manager until his death. About the time he accepted the Western Electric position he became interested actively in the work of the Kansas City Association of Credit Men, serving as director, as president of the association in 1914 and as director of the National Association of Credit Men in 1916. For several years he was also principal instructor in the school of credit of the Kansas City association and was chiefly responsible for the growth and success of this school.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

April Fails to Halt Decline in Electrical Exports

ELECTRICAL exports for the month of April showed a large decrease from the total for the previous month, the loss amounting to more than $1,000,000, or about 20 per cent. The figure for April was only $3,859,428, as compared with $4,927,984 for the preceding month and with $8,467,820 for April a year ago. Just why this large drop should have occurred during April is hard to explain, particularly since the previous month had shown a satisfactory increase over February. A large number of the items listed in the table below showed a smaller demand, but, on the other hand, many item totals increased over March, so that the explanation of generally bad conditions in foreign markets cannot be applied in this case.

Those items which show increases as compared with March include copper wire, direct-current generators and alternating-current generators under 2,000 kw., wet batteries, rectifiers, transformers other than power, switch and panelboards, switches and circuit breakers, fuses, meters, lightning arresters, stationary motors, carbon lamps, searchlights, motor-driven household devices, heating devices, therapeutic apparatus, radio apparatus, signal apparatus in general, conduit, wiring supplies and fixtures. Perhaps the most startling shrinkage was shown by insulated wire and cable, none of which was exported in April against $129,002 in March. Other important lines whose totals dropped during the month were electrical porcelain, alternating-current generators over 2,000 kw., dry and storage batteries, power transformers, fractional-horsepower motors, electric fans, metal-filament lamps, telephone apparatus, spark plugs and magnetos.

Wherever the new classification permits comparisons to be made April, 1922, shows up very poorly beside the same month last year, with the exception of copper wire and carbons for lights.

The table was compiled from figures supplied by the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C.

Sales Increase for 32 per Cent of Jobbers in First Quarter of 1922

THAT thirty-nine electrical supply houses reported increases in percentages of sales for the first three months of 1922 as compared with the same months of 1921 is shown in a report just issued by the Electrical Supply Jobbers' Association and which is compiled from data returned by a total of 122 main and branch houses in all

ELECTRICAL EXPORTS FOR APRIL, 1922, COMPARED WITH CORRESPONDING PERIOD A YEAR AGO.

	—April, 1921— Volume	Value	—April, 1922— Volume	Value
Electrical glassware, except for lighting, lb.	.....	.....	143,284	$ 9,791
Electrical porcelain, lb.	.....	.....	735,054	107,784
Carbons for electric lighting, electrodes and batteries, lb.	.....	$12,059	584,569	49,928
Insulated wire and cable (iron and steel), lb.	.....	.....	122,927	23,819
Other manufactures of aluminum, lb.	.....	209,745	191,909	64,798
Copper wire (bare), lb.	711,858	133,051	2,217,709	308,340
Insulated copper wire and cable				
Generators:				
Direct-current—				
Under 500 kw., number	.....	.....	382	71,502
500 kw. and over, number	.....	.....	5	98,674
Alternating-current—				
Under 2,000 kw., number	.....	.....	38	31,354
2,000 kw. and over, number	.....	.....	2	114,170
Accessories and parts of generators, lb.	.....	.....	8,631	10,202
Self-contained lighting outfits, number	.....	.....	72	22,622
Batteries—				
Primary—dry, number	.....	.....	294,727	85,795
Primary—wet, number	.....	.....	1,136	1,716
Storage, number	.....	.....	8,141	109,300
Transforming or converting apparatus:				
Power transformers, number	.....	.....	499	124,337
Other transformers, number	.....	.....	2,920	117,461
Rectifiers, number	.....	.....	257	4,946
Condensers, double-current and motor-generators, dynamotors, synchronous and other converters, number	.....	.....	1,238	40,868
Transmission and distribution apparatus:				
Switchboards and panelboards, except telephone, number	.....	.....	225	227,911
Switches and circuit breakers, number	.....	.....	140,558	157,974
Fuses and fuse plugs, number	.....	.....	164,415	15,169
Watt-hour and other measuring meters, number	.....	.....	8,385	73,662
Volt, watt and ampere meters and other recording, indicating and testing apparatus, number	.....	.....	6,892	64,218
Lightning arresters, choke coils, reactors and other protective devices, number	.....	.....	1,965	30,571
Motors, starters and controllers:				
Motors, under 1 hp., number	.....	.....	3,238	54,126
Stationary motors—				
1 hp. to 200 hp., number	.....	.....	1,171	212,567
Over 200 hp., number	.....	.....	46	82,585
Railway motors, number	.....	.....	.....	3 $ 300
Electric locomotives, number	.....	5 $ 31,499	.....	.....
Other motors, number	.....	1,711,620	2,373	59,966
Rheostats, controllers and other starting and controlling equipment, lb.	.....	164,745	128,163	43,170
Accessories and parts for motors, lb.	.....	.....	116,846	65,633
Electric appliances:				
Electric fans, number	10,089	120,361	6,751	96,593
Electric lamps—				
Arc, number	133	1,927	55	1,233
Incandescent—				
Carbon-filament, number	84,796	22,602	23,754	6,123
Metal-filament, number	1,316,251	384,224	276,080	78,205
Other electric lamps, number	.....	.....	11,810	9,845
Flashlights, number	.....	.....	15,629	10,707
Searchlights and projectors, number	.....	.....	362	18,096
Motor-driven household devices, number	.....	.....	3,312	58,489
Domestic heating and cooking devices, number	.....	165,962	14,401	59,947
Industrial electric furnaces and ovens, number	.....	.....	42	11,205
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc., number	.....	.....	489	52,988
Signal and communication devices:				
Radio and wireless apparatus, lb.	.....	.....	105,611	116,221
Telegraph apparatus, lb.	.....	.....	41,262	43,088
Telephone including switchboards, lb.	.....	.....	196,899	290,188
Police, fire and burglar alarm, lb.	.....	.....	2,700	5,006
Railway signals, switches and attachments, lb.	.....	.....	215,185	54,332
Bells, buzzers and annunciators, number	.....	.....	5,271	4,985
Other electric apparatus:				
Spark plugs, magnetos and other ignition apparatus, lb.	.....	131,474	87,471	85,852
Metal conduit, outlet and switch boxes, lb.	.....	.....	291,009	26,790
Sockets, outlets and receptacles, number	.....	.....	119,717	28,061
Other wiring supplies and fixtures, lb.	.....	170,038	162,849	86,652
Other electrical apparatus not elsewhere specified, lb.	.....	2,485,766	1,819,027	736,845
Total	.....	*	.....	$3,859,428

* Total electrical exports for April, 1921, amounted to $8,467,820. This figure is not included in the above table because of the incompleteness of figures for that month under the new classification.

COMPARATIVE INCREASE OR DECREASE IN SALES IN PERCENTAGE FOR THE FIRST THREE MONTHS OF 1922 AS COMPARED WITH THE SAME PERIOD OF 1921

	No. of Houses Reporting	Increases			Decreases		
Zone 1: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island and Connecticut	..	10.00	10.00	10.00	4.00 16.00 25.00	5.80 16.00 3.10	8.00 11.00
Zone 2: New York and New Jersey	18	21.00 2.00 4.24	20.00 20.00 6.45	31.40 10.00 30.00	3.00 26.00 24.00	12.00 39.34 3.50	28.73 20.40 8.70
Zone 3: Pennsylvania and West Virginia	14	6.00	7.00	6.00	25.60 29.20 28.00 33.00	33.00 50.20 25.00 48.00	11.00 21.00 44.00
Zone 4: Maryland, Delaware, District of Columbia and Virginia	5	16.60	2.95		5.40	15.00	10.60
Zone 5: Ohio and Kentucky	11	1.60	15.70		27.00 16.21 17.70	24.98 23.00 27.81	15.30 7.80 26.00
Zone 6: Michigan and Indiana	9	11.20 13.21	15.00 2.20	13.93	10.70 33.00	23.00	2.17
Zone 7: North Carolina, South Carolina, Georgia and Florida	4				4.92 24.00	25.30	25.50
Zone 8: Wisconsin and Illinois	8	2.60	7.20		25.00 12.13	7.50 20.00	6.80 14.00
Zone 9: Tennessee, Arkansas, Alabama, Mississippi and Louisiana	4				16.10 40.50	15.90	½ of 1% (.5)
Zone 10: Minnesota, North Dakota, South Dakota and Iowa	7	19.67	19.00		31.00 24.00	15.00 39.90	8.30
Zone 11: Nebraska, Kansas and Missouri	9				22.30 18.70 14.00	15.00 6.96 24.00	1.00 25.70 1.50
Zone 12: Oklahoma and Texas	2	27.60			21.00		
Zone 13: Montana, Wyoming, Idaho and Utah	5				34.20 29.20	21.90 38.00	29.00
Zone 14: Colorado, New Mexico and Arizona	3	25.00				20.00	1.20
Zone 15: Washington and Oregon	6	3.46 23.60	11.33⅓ 1.00	31.70			8.00
Zone 16: California and Nevada	6	6.50 25.40	4.71	9.50	20.00	1.81	

parts of the country. This is 32 per cent. Eighty-three houses showed decreases.

Of eighteen houses reported in the New York and New Jersey zone, nine returned decreases and as many others returned increases.

Taking the average percentage of the total number of houses that reported increases, the result amounts to a general gain of 12.80 per cent over 1921. The percentage of decrease for houses reporting losses in sales over the first three months of 1921 is an average loss of 19.21 per cent.

Severe Jobber Competition Keeps Wire Price Down

IN SPITE of the fact that the present price of refined copper, 14 cents per pound for electrolytic, represents the highest point reached by that commodity in the last two years quotations of jobbers on all sorts of wire have failed to show much increase. This paradoxical situation is the result of the fact that many jobbers have large stocks of rubber-covered, weatherproof and bare wire, ordered at old prices in expectation of a heavy spring demand, and are attempting to move it quickly by keeping the price low.

There is a fair market for wire, particularly the rubber-covered type and bare wire for radio purposes. Demand for rubber-covered is expected to improve as more and more of the building started in the last two and three months reaches the electrical stage. At present, however, demand falls considerably below supply, and so jobbers are doing quite a bit of price cutting. It is possible to obtain No. 14 rubber-covered wire in 5,000-ft. lots in New York as low as $6 per 1,000 ft., with other quotations running as high as $6.25. There have even been some instances reported of large buyers obtaining a quotation as low as $5.90 per 1,000 ft. In other cities farther away from the wire-drawing plants the price runs as high as $6.75. Nowhere, however, do reports show that the rise in copper has had more than a slight firming effect on the wire market.

How long these prices will be quotable depends on how large jobbers' present stocks are. Wiredrawers are being forced to pay more for their raw materials, and sooner or later this will reach the jobber and the contractor. As noted above, copper is rising steadily and the producers are making every effort to give the increase a healthy and permanent character. Cotton at the end of last week had risen to 20¾ cents per pound for July delivery, and reports of bad weather in the West caused more unsettlement in the market than even this price shows. Rubber during April advanced 2 cents a pound for spot. It is estimated that New York stocks are very large, but they are controlled by strong interests, and attempts by buyers to obtain lower than sellers' prices have failed. Lead demand is fair, and while no large price increases have occurred lately, the market is firm.

Metal Market Situation

At the beginning of the week the copper market was generally quotable at from 13⅞ cents to 14 cents per pound, electrolytic, delivered in May or June. How long the price will remain at or below 14 cents is dependent to a very large extent on the attitude of the buyers. If demand should continue at the pace it set last week, 15-cent copper is not at all an impossibility. However, there were signs by Saturday of last week that the rush was over at last and that consumers were beginning to feel that their requirements for the next couple of months were covered safely. Whether this hesitation was caused entirely by the feeling that needs were filled or was due somewhat to the approaching holiday remains to be seen.

NEW YORK METAL MARKET PRICES

Copper:	May 23, 1922	May 29, 1922
London, standard spot	£ s. d. 62 2 6	£ s. d. 62 2 6
	Cents per Pound	Cents per Pound
Prime Lake	13.87½	13.87@14.00
Electrolytic	13.75	13.75
Casting	13.12½	13.37½
Wire base	15.12½–15.37½	15.12½–15.37½
Lead, Am. S. & R. price	5.50	5.65
Antimony	5.37½–5.50	5.37½– 5.50
Nickel, ingot	36.00	36.00
Sheet zinc, f.o.b. smelter	7.50	7.50
Zinc, spot	5.50	5.62½
Tin, straits	30.87½	31.75
Aluminum, 98 to 99 per cent	19.10	17.87½
OLD METALS		
Heavy copper and wire	11.50 –11.75	11.50 –11.75
Brass, heavy	5.25 – 5.75	5.50 – 6.00
Brass, light	4.87½– 5.25	4.87½– 5.25
Lead, heavy	4.70 – 4.80	4.70 – 4.80
Zinc, old scrap	2.75 – 3.00	2.87½– 3.00

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

THE electrical industry in many parts of the country seems to have spent last week in a state of suspended animation. There was the usual activity in wiring material and radio. Outside of that jobbers and dealers had not a great deal to do, though the prospects are that June will be a busy month with its flood of wedding-gift buying and the real start of the fan season. Chicago, owing to a spell of sultry weather, is proving a very good market for fans. Thus far the Middle West city is alone in this regard, though Atlanta retailers have been selling them to some extent.

Low motor stocks is the phenomenon reported from San Francisco. It is estimated that demand there will exceed supply about as long as it takes manufacturers to learn of the condition and get shipments through. St. Louis and Southwestern utilities are buying more freely from electrical jobbers than are industrials. Boston and Atlanta jobbers also report sustained buying of some kinds of materials.

Prices are unsettled, particularly those of wiring materials. Jobbers all over, and this includes some of the larger houses, are cutting prices viciously, and the condition is creating much dissatisfaction in the jobbing trade and among manufacturers.

NEW YORK

Little if any change in conditions in the electrical trade was reported by the jobbers this week. Business is moving along in a fairly even manner, some days showing more activity than others, but on the whole there is a steady volume of orders coming through. There is a good demand for wiring materials of all kinds, and prices are being well maintained, with the possible exception of rigid conduit, on which there is a reluctancy to advance quotations to conform with the last schedule. Wire prices have stiffened slightly in response to the increased cost of copper; however, there has been no material advance in quotations thus far.

The building activity in this section shows no signs of letting up, and while the new construction which is just being started will not reach the electrical stage until the latter part of the summer, it constitutes a large potential market which may be counted upon. Fan sales so far this season have been about 25 per cent ahead of last year, and present indications point to a banner summer.

Rigid Conduit.—Jobbers so far have held to the old quotations on pipe, and there is considerable price competition throughout the trade. Large stocks and orders placed before the last advance tended to hold down quotations. Some jobbers are holding for the new schedule but are making no sales. Quotations this week showed the following range. For ½-in. black pipe in 2,500-ft. lots, $44.50 to $46.58; ¾-in., $58.10 to $59.57, and 1-in., $82.79 to $84.66 per 1,000 ft. Quotations on galvanized pipe in the same sizes and quantities were $50 to $51.68, $64.50 to $66.47 and $92.20 to $94.88 per 1,000 ft.

Rubber-Covered Wire.—Although quotations on wire were a little easier last week, they have stiffened somewhat because of the higher cost of copper. No. 14, rubber-covered, single-braid, is quoted at $6 to $6.15 per 1,000 ft. in 5,000-ft. lots, and while the demand is not heavy, there is little tendency to shade these prices.

Flexible Armored Conductor.—Stocks in jobbers' hands ear ample to meet the present demand, which is fairly steady. No. 14, two-wire, single-strip, sells for $43 per 1,000 ft., and double-strip for $45 per 1,000 ft., both for that quantity or over.

Metal Moulding.—Prices on this material are slightly lower than previously reported. The three-wire size in 1,000-ft. lots is now quoted at $4.80 per 100 ft. The cash discount, however, has been reduced from 5 per cent to 2 per cent.

Sockets.—No change in prices has been reported. In standard-package lots of 250, full-chain sockets sell for 33 cents each, key sockets in lots of 500 for 18 cents each, and keyless in the same quantity for 16 cents each.

Tape.—Friction and rubber tape are both quoted at 36 cents per pound in lots of 25 lb. and over.

Fans.—Sales have been exceptionally good so far this spring, showing an increase thus far of about 25 per cent over those of last year. The decrease of about 12 per cent in prices has helped stimulate this business.

CHICAGO

The electrical trade is steadily but slowly moving upward. Not a few indications of this fact were apparent in the past week, an improved demand for rubber-covered wire and conduit being one sign. The steady increase in building permits is causing this demand, and from estimates obtained the month of May to date will equal if not better April. Manufacturers of high-tension equipment are unanimous in reporting a brisk business. Poles and pole-line equipment are also selling well.

Illinois employment conditions have also improved. The May report of the Free Employment Bureau states that for every 100 jobs offered only 141 applications were received. This is the lowest mark since November, 1920. The metals, machinery and conveyance group reported an increase of 2.6 per cent. The sheet-metal workers averaged an increase of 8.9 per cent, the contractors one of 18.7 per cent, structural iron workers one of 7 per cent.

Wire.—The market for rubber-covered No. 14 wire is improving and jobbers are reporting a good volume of sales to contractors for house wiring. In 5,000-ft. lots this material sells for $6 per 1,000 ft. Stocks are in good condition. Weatherproof and bare wire have felt the strengthened copper market, and both of these commodities are selling around 16¾ cents per pound.

Conduit.—This material is also showing activity. The price is still maintained at $43 per 1,000 ft. for the ½-in. black pipe and stocks are ample.

Flexible Armored Conductor.—The call has been steady, though jobbers explain that the demand for conduit and wire has been heavier than for the armored conductor. Prices have remained constant and the No. 14 two-wire, single-strip, is available in 5,000-ft. lots at $43 per 1,000 ft. Stocks are in good condition.

High-Tension Equipment.—The week's business was reported brisk by the majority of manufacturers. One company filled orders for utilities in the Northwest.

Poles.—The pole situation appears to have remained unchanged, most dealers saying that activity is continuing at a brisk rate. Most of the orders appear to be for replacements. Stocks are good, and no price changes have occurred.

Pole-Line Hardware.—This material, following the good movement in the pole-line demand, is active. Prices have not changed and stocks are ample.

Cross-Arms.—Maintenance and repairs on utility lines have stimulated the demand for cross-arms so that dealers state there is a much better market for this material than on poles. The standard 3-ft. 3½-in. x 4½-in. fir arm in 1,000-ft. lots is priced at $45.68 per 100, f.o.b. Chicago.

Fans.—Sultry weather during the past few weeks has aroused public interest in fans, and most dealers are reporting an active start of their summer business. The 16-in. oscillator appears to be the most popular and stocks are good.

BOSTON

Business continues on the upward climb despite labor troubles in the textile industry and very slow improvement in foreign trade conditions. Probable acceptance of a 15 per cent wage reduction by shoe-factory workers at Lynn marks a better outlook in the leather field. Metal-working plants in New England are doing better, and the rubber factories are very busy. Paper mills continue active and car builders are handling large orders, one New Hampshire plant having $1,500,000 of business on its books. Woolen mills are well employed. Retail electrical stocks are running lower and resultant buying from jobbers is in considerable evidence. Prices are about the same as last week in electrical circles. Central-station outputs are gaining steadily, and a better outlook for small-power business is apparent. Local industries are much interested in the rate reductions ordered upon the railroads, but it is too early to gage their effect on New England business in general. Public utility financing is progressing well, an issue of $35,000,000 New England Telephone & Telegraph Company bonds having been oversubscribed during the week. Building operations continue to boom.

Wire.—Competition in wire sales is very sharp. Rubber-covered No. 14 was moving at the week end at $6.25 per 1,000 ft. in 5,000-ft. lots. Central stations are buying moderate quantities of weatherproof, and radio enthusiasts continue to dominate the market for bare copper wire of smaller sizes. No shortage is now apparent in the latter.

Flexible Armored Conductor.—Sales are in good volume on account of the large amount of interior wiring under way. House-wiring campaigns in many parts of New England are meeting with remarkable success. No. 14 single-strip is moving around $44.20 per 1,000 ft. in 1,000-ft. lots, with plenty in stock in all localities.

Loom.—Sales are exceedingly dull, and the small-order business existing is handled at acute competitive figures. It is suggested that not a little of this material changes hands below cost to the jobber in order to move it, and considerable dissatisfaction with the price situation is known to exist in the trade.

Knobs and Tubes.—Fairly steady sales are reported, with little change in prices from week to week. "Nail-it" knobs are selling at $18.25 per 1,000 in barrel lots and 3-in. tubes at $5.85 in the same quantity.

Meters.—Sales are probably 10 per cent better than last winter, and one distributer reports a gain of at least 25 per cent in new business as compared with a year ago. Most of the meters sold are absorbed into residential construction programs. Prices have been steady for many months, and stocks are easily maintained for prompt deliveries.

Motors.—Little week-to-week change in the motor market is apparent, but the tendency is toward better sales. Central-station power sales departments are now adding loads in moderate volumes to existing lines, and this means a good deal of scattered but cumulative demand upon motor stocks.

ATLANTA

Agricultural activities which have got well under way have been materially slowed down by a week of rain, with a consequent delay in getting planting finished and a retarded growth of cotton just up. The price of Atlanta cotton reached 20 cents last week, and this price is stimulating the sale of cotton held since last fall, with a resultant improvement in the liquidation of old accounts. Business, as a whole, however, does not show a very rapid improvement, though all indications point to a much healthier condition than has existed for several months, with prospects very bright for great improvement by fall.

The cut in freight rates recently announced by the Interstate Commerce Commission will be a great help to the South, and the opinion expressed by prominent business men is that this reduction will go far toward reawakening business in general. Electrical jobbers report business somewhat better throughout the line, but there is to be noted a complaint that retailers are devoting their primary attention to radio equipment, with the result that heating devices and hollow-ware sales are below what they should be. The large building program which has been under way some little time is beginning to stimulate the sales of electrical building materials, and there is to be noted an increasing demand for industrial equipment in general.

Conduit.—Industrial work, together with the building program, is causing a very satisfactory movement in this line in practically all sizes, both black and galvanized. Local stocks and shipments are both satsifactory, with prices showing no tendency at present to change.

Armored Conductor.—This item is moving very satisfactorily, with a 10 per cent advance in price recently announced. Present quotations for No. 14, two-wire, in lots of 5,000 ft., are $51.15 per 1,000 ft. Local stocks and shipments are satisfactory.

Wire.—A good market is reported on wire in popular sizes, both rubber-covered and weatherproof, though there is a slight reduction in No. 14 rubber-covered of 24 cents per 1,000 ft. Increasing number of inquiries for the larger sizes and for cables for industrial expansion are reported.

Exhaust Fans.—This item has not yet begun its summer movement, though sales continue to hold up fairly well, particularly in the 22-in. to 30-in. sizes. Jobbers' stocks are somewhat spotty with shipments excellent.

Meters.—The movement of meters has not yet responded to the increase that will result from residential and commercial construction, but middle summer should see many buildings completed and ready for service, and then the more popular sizes of meters will of course be in brisk demand. The larger sizes are slow because little industrial business is being connected just at the present time.

Fuses.—This line is following its usual seasonal tendency with a resultant falling off in the volume of orders. There is to be noted an increase in popularity in the refillable type, with plug fuses enjoying their usual steady demand.

Outlet Boxes.—This line is showing the stimulation to be expected from the building program, jobbers reporting a satisfactory movement in all the popular sizes. Both stocks and shipments are satisfactory, with prices steady.

High-Tension Transformers.—Several satisfactory jobs have been closed in the past two weeks, with prospects very fair for the purchase of large units within the next thirty days. Local stocks are very spotty, except in the popular sizes, with shipments at present from six to ten weeks.

ST. LOUIS

Jobbers report that business last week was marked by substantial improvement in demand, particularly from the telephone companies, power companies, railroads and, to some extent, from the industrials. Merchandise lines continue to move at a comparatively slow rate, and house-wiring materials are selling spasmodically yet with continual advancement. It is felt that the improvement being noticed is permanent in character and that further betterment can be expected.

Agricultural conditions on the whole are encouraging. The total strawberry production in the Ozark region will, according to estimates, amount to 2,715 carloads, which will be the largest crop ever harvested. Cotton is behind and has been damaged in some districts by excessive rainfall. There is an increased acreage in cotton this year, however, and it is expected that the yield will at least equal that of last year. With average conditions winter wheat will at least equal the yield of 1921, and spring wheat may do better than for several years. It is too early to make predictions regarding the corn crop, but the total acreage will be about the same as last year. Of particular interest to the farmers is the comparative stability of prices of their products, enabling them to discount their future yields better and to purchase needed supplies and equipment with greater freedom. These conditions aid materially in restoration of business morale in this territory.

With the recent changes in prices of steel, copper and other basic materials jobbers have been making correspond-

ing adjustments in their local prices on goods. A tendency to equalize the prices on competitive lines is also noticed. Among the changes which have occurred may be mentioned a stiffening in quotations on wire, conduit, conduit boxes, locknuts and bushings and lower prices in flexible armored conductor, dry cells and friction and rubber tape. Representative prices are as follows:

Wire.—Rubber-covered, solid, single braid, in coil lots, per 1,000-ft.: No. 14, $6.50; No. 12, $10.25; No. 10, $12.90; No. 8, $17.84. No. 14 solid double-braid sells for $9.23 per 1,000-ft. in coil lots. Triple-braid, solid, weatherproof, is quoted in 500-lb. lots as follows: No. 4/0 to No. 8, inclusive, $16 per 100 lb.; No. 10, $18 per 100 lb.; No. 12, $19.50 per 100 lb.; No. 14, $21 per 100 lb.; No. 18 rubber-covered black fixture wire is priced at $3.77 per 1,000 ft. in coil lost.

Conduit.—The following prices obtain: ½-in. black, $4.56; ½-in. galvanized, $5.20; ¾-in. black, $5.77; ¾-in. galvanized, $6.61—all per hundred ft. in amounts of 100 ft. or more.

Conduit Boxes.—Net prices per 100 boxes, for orders of 100 or more, are: 3¼-in. black octagon, $9; 3¼-in. galvanized octagon, $10; 4-in. black octagon, $11; 4-in. galvanized octagon, $12.

Flexible Armored Conductor.—No. 14, two-conductor, is quoted at $60 per 1,000 ft. in lots less than 250 ft., and at $46 per 1,000 ft. in larger lots. The net price on connectors is $3.60 per 100 for 100 or more.

Tape.—Friction is selling for 35 cents to 65 cents per pound in 100-lb. lots, depending upon grade, and similarly rubber sells for 35 cents to 84 cents. The 35-cent grade in each class is commanding the bulk of the business.

Dry Cells.—Railroad demand and radio are stimulating sales, which have been good without slackening for more than a year. The regular is priced at $30.86 per 100 and the igniter at $31.86 per 100, both in barrel lots. The four-cell unit brings $1.70 each in barrel lots of 24.

SAN FRANCISCO

The past week has shown, all in all, a marked acceleration in trade and building. Industrial and business construction is steady, and the building of single dwellings and small apartment houses is increasing at a marked rate. It is significant that not for years have so many renting opportunities been offered by real-estate agents. Another feature is the remodeling of many old flats into apartment flats. Labor conditions are better than they were. And the clouds that seemed to portend another disastrous strike of the building trades seem to have blown away. Non-employment has been reduced to a minimum even among unskilled laborers, who are being set to work upon municipal housecleaning in expectation of the summer convention traffic. A campaign similar to the "Save the surface" paint movement would benefit electrical contractors if applied, say, to the renovation of old wiring. The lower labor rate is responsible, it is said, for many such small repair jobs.

Motors.—A splendid sale is reported of all sorts of motors, particularly of two-phase and three-phase, and for the first time in several years stocks are at a minimum. In fact, this spring recalls to some extent the conditions of 1920 intensified by the greater amount of power available and its wider distribution.

Radio Apparatus.—An increasing call for better and larger outfits and the entry and active participation of the larger companies feature present conditions. Better stocks are on hand, though factory shipments are still being prorated upon their receipt. Tenser competition is noted, many of the newer dealers offering considerable discounts to schools and industrials, and even to private individuals.

Household Appliances.—Clothes washers are selling better, justifying the belief that big commissions for vacuum cleaners had caused their temporary sidetracking. Far fewer makes are being sold than at this time last year, although an occasional new type appears at regular intervals. Still the backbone of the washer business is made up of long-established types. The mercantile stores show a tendency to raise the list in order to raise their solicitors' commissions. For instance, one particular cylinder type is being sold at about $160 with a commission of $25 to salesmen, whereas the market price for cylinder machines averages from $130 to $140. Vacuum cleaners in general have slackened somewhat, the bulk of the sales being made by hardware and household stores. Sewing machines are slow, ironers are moving very well and dishwashers are slower than a few weeks back.

Schedule Material.—Stocks in general are excellent and shipments are coming through well. Demand is large and well proportioned.

SALT LAKE CITY—DENVER

Denver crop forecasts for the Intermountain region are highly encouraging. There have been no serious late frosts to damage fruits and the planting is proceeding normally. Acreage for the staple crops is holding up to a good average with the exception of sugarbeets, in which there is a considerable falling off. Wool growers are getting a record price for their clips, 40 cents a pound not being an uncommon figure. This timely market will go a long way toward steadying and rehabilitating an industry that has been unusually hard hit. Recent readjustments of freight rates are very favorable, putting the jobbers in a better position to compete with Pacific Coast distributers. Labor conditions are satisfactory. Unemployment is fast disappearing, with the farms, mines and construction projects constantly absorbing men who have been idle. Interest continues to grow in radio. A company has been organized in Salt Lake City that will proceed at once to erect a factory equipped to turn out all kinds of radio apparatus.

Fans.—The fan season has not yet begun in this territory as the weather is still moderately cool. Jobbers and dealers, however, are getting ready for a good business. Stocks on hand are ample, covering a full range of types and sizes. A price reduction that amounts to nearly 20 per cent is counted on to stimulate buying.

Ranges.—It is believed that the coming summer will record a good movement of electric ranges from dealers' stocks to housewives' kitchens. "Cook electrically" propaganda is widespread and persistent. Reductions averaging from $31 to $80 are quoted by one large distributing concern. Sales to date have been satisfactory.

PORTLAND—SEATTLE

The reduction of 10 per cent in freight rates ordered by the Interstate Commerce Commission will, it is predicted, have a very stimulating effect on the industry of the Northwest. A reduction of 12½ per cent in rail tariffs affecting lumber, effective July 1, will do much to help trade with the interior. Lumber production for the week ended May 20 was 5 per cent above normal, while new business was 18 per cent and shipments were 5 per cent above production. Building continues very active throughout the Northwest.

An unprecedented movement of tourists to the Northwest is forecast by advance bookings made with the park hotels for the summer season. Railway officials say that homeseekers from the East and Middle West in considerable numbers will seek permanent homes here this summer.

Business in the electrical trade is showing gradual gains from week to week. Household appliances are moving well. The improved demand for wire is reflected in advances during the week in both bare and weatherproof prices. Rubber-covered is expected to advance in the near future. The base prices of bars and weatherproof wire are now 15½ cents and 17½ cents per pound respectively. Seattle jobbers report an increase of 5 per cent in the price of rigid conduit.

Heaters.—Stocks were very well cleaned up this year, and fans are beginning to move actively. Retail prices on fans reach from $10 for the 8-in. non-oscillating to $35 for the 16-in. oscillating type. Ranges are moving very well, particularly in Portland. The demand for washers, ironers and vacuum cleaners is only fair, the prices remain unchanged, washers selling at about $140, ironers, manual type, at $170, automatic type at $185, and vacuum cleaners at $45.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

General Electric Moves Controller Department

The General Electric Company, Schenectady, N. Y., is removing its controller manufacturing department to its Erie (Pa.) works and will concentrate production in this line there. A working force of about 150 men will be employed, and this quota will be increased at an early date. The Banner Electric Division of the National Lamp Works of the company will build an addition to its plant at Youngstown, Ohio, to cost about $75,000.

Chicago Engineer Moves to New Location

C. A. Chapman, Inc., is now established at the Madison Terminal Building, 9 South Clinton Street, Chicago, having recently moved from 28 East Jackson Boulevard. The changeover will afford this engineering company an increase in floor space of approximately 25 per cent.

Roller-Smith Company Moves Chicago Office

The Roller-Smith Company, formerly at 739-40 Monadnock Block, Chicago, has moved its office to 430 South Green Street. Mortimer Frankel, Western sales manager, says that while no changes have been made in the personnel of the office it will be conducted as an agency rather than a branch office. Improvement in business due to the radio demands has been noted by the company.

Fixtures Better Last Year's Sales, Says Manufacturer

The fixture business has made larger sales during the first four months of 1922 than during the same period of 1921, according to Robert Biddle, president of the National Council Lighting Fixture Manufacturers and president Biddle-Gaumer Company, Philadelphia.

"As president of the National Council Lighting Fixture Manufacturers," he said, "I have received reports for the past few months from different sections, these reports showing particularly a better business trend in the West. The improvement in the West is due to fewer labor disturbances.

"I understand that business in Los Angeles is much better than elsewhere for lighting fixtures. In Philadelphia the sale of lighting fixtures is holding its own at present, but the demand is for a cheaper quality owing to the fact that much building of small houses is under way. With the increased building in Philadelphia and with the considerable number of permits being taken out each month, we expect a good volume of sales when the houses at present under construction are completed and the residential building that is going on in the suburbs is finished. Better grade of fixtures well then be in greater demand.

"Prices of electrical goods are firmer, with a possible slight increase in the fall. Considering these various conditions, an optimistic opinion can be taken of the present and future business outlook."

Blumenthal-Kahn to Build New Plant Soon

The Blumenthal-Kahn Electric Company, 505 North Eutaw Street, Baltimore, has acquired property at 527-29 North Howard Street, comprising a four-story and two-story building, for a consideration of about $100,000. The structures are now occupied under leases, and as soon as these expire the buildings will be razed and a new five-story plant erected for exclusive use of the company.

Radio Manufacturer Merges with Phonograph Maker

The Air-o-phone Corporation, 122 Fifth Avenue, New York, manufacturer of radio apparatus, has completed an amalgamation with the National Phonograph Company of Canton, Pa. Under the new arrangement "Air-o-phones" will be manufactured and assembled at the plant of the National Phonograph Company at Canton. A move of this character was necessary, it is stated, owing to the large demand for radio equipment. Increased manufacturing facilities were needed quickly, and the new arrangement will permit the manufacture of sufficient apparatus to take care of the present demand. The estimated production will be in the neighborhood of 300 machines weekly.

Lewis T. McFadden, president of the National Phonograph Company, was elected vice-president of the Air-o-phone Corporation.

Specialty Maker Speeds Up Production

The Connecticut Telephone & Electric Company, Britannia Street, Meriden, Conn., has increased production at its plant to about 75 per cent of normal. The bulk of production is devoted to electrical specialties for automotive service.

Westinghouse Agent-Jobbers in Session at Hot Springs

The thirty-four agent-jobbers of the Westinghouse Electric & Manufacturing Company and their guests were in session this week at the tenth annual convention of the Westinghouse Agent-Jobbers' Association. The meetings extended from Monday until Friday, with Monday set apart as guest day with open sessions. H. A. Lewis, business manager *Electrical Merchandising*, made an interesting address on "Capitalizing the Dealer," in which he pointed out the vital need for interesting local capital in the development of the electrical business in each community. The automobile business, he said, was financed in each town through the fact that the local "J. P. Morgan" purchased a car, became interested and invested money in the first garage, supply house and agency. The same fount of capital may be tapped by the electrical industry.

F. F. Watts, editor *Electrical Record*, talked on promoting the greater use of electricity and painted a graphic picture of the opportunity that lies ahead. William L. Goodwin, assistant to the president of the Society for Electrical Development, told the story of the evolution of that organization and its present scope and purpose. John J. Jackson, counsel for the Agent-Jobbers' Association; T. E. Berger, secretary Society for Electrical Development, and Earl E. Whitehorne, commercial editor ELECTRICAL WORLD, also spoke.

The evening session was devoted to the subject of radio, with addresses by M. C. Pykinski, Westinghouse Electric & Manufacturing Company, and David Saranoff, general manager Radio Corporation of America.

Associated Engineers Establishes Survey Service

The Associated Engineers, Incorporated, 86 Michigan Street, Milwaukee, have announced the establishment of a quantity survey service which will be supplied to engineers and architects who desire this data as part of their plans and specifications.

Instrument Company Enters Radio Field

The Bristol Company, Bristol, Conn., for many years a producer of electrical and other recording instruments, has announced its entrance into the radio apparatus manufacturing field.

The company now is in production on a loud-speaker horn, which is sold under the trade name "Audiophone." For the last six years the company has been carrying on research work for the purpose of developing a loud speaker for use with the Bristol talking moving pictures soon to be placed on the market. The adaptation of this loud speaker to radio work was decided on recently.

New Huntington Headquarters for Westinghouse

The Westinghouse Electric & Manufacturing Company has recently erected and is now occupying the Westinghouse Electric Building, at Second Avenue and Ninth Street, Huntington, W. Va. In the new building the activities of the sales, service and warehouse departments have been co-ordinated, and this, with the furnishing of more adequate facilities, is expected to result in better service to customers.

The building is a three-story structure containing 30,000 sq.ft. of floor space. Convenient railroad sidings permit the direct handling of inbound and outbound freight, and the adequate floor space allows for the stocking of large apparatus and sufficient quantities of the smaller apparatus to meet the immediate demands of customers.

The service department is fitted to repair all classes of electrical apparatus. The department maintains close contact with the engineering department at the Westinghouse East Pittsburgh Works and as a result engineering advice is immediately available. Arrangements have been made to furnish steam and electrical engineers to install, inspect and repair equipment in the field.

The Westinghouse company plans to maintain its offices at Bluefield and Charleston, W. Va., in addition to the added facilities of the Huntington branch.

National X-Ray Company Acquires Winslow Library

Owing to the retirement from the commercial world of the Winslow Brothers Company, well known for its skill in the creation of ornamental bronze and iron work, the National X-Ray Reflector Company, Chicago, it is announced, has been enabled to obtain the famous Winslow Library of designs to add to the equipment of its designing staff. The library consists of 189 volumes gathered by the senior member of the Winslow Brothers Company and represents long years of research in all parts of the world. The collection is said to be one of the most complete of its kind in existence. It is to be used by the National organization as an aid in properly interpreting the true spirit of any architectural treatment in the design of lighting fixtures.

A New Manufacturer of Loud Speakers

The Radio Telephone Company, 160 North Wells Street, Chicago, has recently been incorporated with a capital stock of $15,000. This company controls five patents on loud speakers and is manufacturing the "Electra-Voice" loud speaker for radio, musical and vocal reproduction, patented radio apparatus and flasher tubes. P. S. Bear, the general manager, while speaking with a representative of the ELECTRICAL WORLD, said that he expected to lease a plant in the near future but that at present no definite plans had been laid. He also reported a steady demand for radio equipment, particularly the loud speaker. The officers of the company are: William G. Keith, president; P. S. Bear, general manager; B. E. Cover, secretary; E. G. Hall, treasurer.

Electric Fusion Corporation Reorganizes and Expands

The reorganization of the American Electric Fusion Corporation, Chicago, and its plans for immediate expansion have been announced. The capital stock of the company has been increased from $30,000 to $40,000 and larger quarters have been attained, consisting of 8,000 sq.ft. of floor space at 972 Montana Street. This gives the company six times its previous space, and its production is being increased proportionately. In addition to this the company has purchased the complete equipment of the Picturola Corporation. The company's business has increased 300 to 400 per cent within the last twelve months, and the added production is necessary to catch up with the bookings. Production consists of welding machines, and in the near future three new types, including a small spot welder and a seam welder, are to be added to the line.

In the reorganization E. J. Henke has been re-elected president, A. B. Sonneborn has been made vice-president and G. F. Strand secretary and treasurer. Mr. Strand was formerly president of G. F. Strand & Company, Chicago, pattern maker and machinist, and joined the forces of the American Electric Fusion Corporation recently after his plant had been destroyed by fire. He will have charge of manufacturing.

Electric Refrigerator Company Finds Expansion Necessary

The Icenomor Electric Refrigerator Company, Evansville, Ind., has experienced so great a demand for its product this spring, according to E. D. Pellegrin, president, that removal to larger quarters has been necessitated. The company has procured the factory formerly occupied by the Shimer Steel & Wire Company, Evansville, and has started production there. The new plant consists of a main building, 50 ft. x 210 ft., situated on the river front and having also a private railroad spur for both the receiving and shipping departments, giving good facilities for shipping both by rail and water. There are also included in the plant a private power plant and several office buildings.

Mr. Pellegrin stated to the ELECTRICAL WORLD that the company is now producing about 100 household refrigerating units a month and is booking orders so fast that a material increase in production is planned. A. B. Owen is vice-president and superintendent; F. R. Cook is treasurer and sales manager, and F. W. Rank is secretary and assistant treasurer.

The Betts & Betts Corporation, electrical manufacturer, 511 West Forty-second Street, New York, has appointed W. Ross Hilton as its sales representative in Quebec, Ontario, New Brunswick and Nova Scotia territory, with headquarters in Montreal. The company also has arranged to have its Minnesota, North and South Dakota territory covered by the Spector Company, St. Paul.

The John L. Taylor Company, dealer in power and other machinery, has removed from the Bulletin Building to 211 North Third Street, Philadelphia.

The P. A. Geier Company, Cleveland, vacuum-cleaner manufacturer, reports a successful exhibit of its product at the recent electrical exposition in Geneva, Switzerland. Modern cleaning processes, it is estimated, were viewed by more than 30,000 visitors.

The Garde Company, manufacturer of electrical goods, Hartford, Conn., has filed a certificate with the Secretary of the State of Connecticut to increase the capital stock of the company from $10,000 to $50,000.

The American Supply Company, 135 Washington Street, Providence, R. I., has been appointed agent for the Providence district to represent the Quigley Furnace Specialties Company, New York, manufacturer of "Hytempite." The Quigley products are warehoused in Providence for quick delivery to local points.

The Delco-Light Company, Ltd., of Canada, has been organized by the American company to manufacture and sell the "Delco-Light" products in Canada. R. H. Myers will be in charge of the plant at Oshawa, Oont.

A. H. Grebe & Company, manufacturers of radio sets and parts, Jamaica, N. Y., are building a three-story addition to their plant. It is 80 ft. x 100 ft. and is expected to cost about $100,000.

Shepherd & Hovey, consulting engineers, 53 West Jackson Boulevard, Chicago, have succeeded C. H. Shepherd, who had an office at the same address. The members of the firm are S. S. Hovey and C. H. Shepherd.

The Electric Hoist & Derrick Company is represented at Hog Island, Pa., by Frank M. Gorsuch and Benjamin Samler, instead of by W. H. Price, Jr., as stated on page 982 of the May 13 issue of the ELECTRICAL WORLD.

The Bristol Company, manufacturer of recording instruments. Waterbury, Conn., has opened a branch office in Philadelphia at 1311 Widener Building. C. C. Eagle, Jr., is in charge.

The Electrical Engineering & Manufacturing Company, Pittsburgh, has established a branch office in Cleveland. J. P. Hutcheson is branch manager, with headquarters in the Union Building.

The Locke Insulator Company, Victor, N. Y., will commence immediately to erect a one-story addition to its Baltimore plant at Charles and Cromwell Streets, to cost about $35,000.

Foreign Trade Notes

PROPOSED WIRELESS SERVICE BETWEEN SWEDEN AND THE UNITED STATES.—In 1920 the Swedish government, *Commerce Reports* states, appropriated 2,000,000 crowns for the establishment of wireless-telegraph communication between Sweden and the United States. Negotiations were entered into with an American company, but up to March, 1921, no agreement had been reached. On that account and the general business depression the matter was not presented to the 1921 Riksdag. The question has now been brought before the government again in a note from the Telegraph Administration, with the intention of requesting permission to use the 2,000,000 crowns previously appropriated in order to proceed with the project.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

A commercial agent in Canada (No. 2,212) wishes to secure the representation of firms for the sale of electrical goods of all kinds.

A merchant in Austria (2,214) desires to secure the representation of firms for the sale of electrotechnical material, iron and steel products.

A manufacturer in Mexico (No. 2,215) wishes to purchase an electric water-purifying plant, with a capacity of 12,000 one-half-pint bottles daily, for use in soft-drink factory.

The purchase of electrical supplies, hardware, etc., is desired by an importer in Spain (No. 2,221.)

An agency is desired by a firm in South Australia (2,260) for the sale of electrically operated machinery, self-contained lighting outfits and miscellaneous electrical equipment, etc.

A commercial agent in South Africa (No. 2,283), covering the Transvaal, wishes to secure representation of manufacturers of a moderate-price belting for the market on the Rand, direct-coupled, direct-current motor and centrifugal pumping sets, with a capacity of 500 gallons in twenty-four hours, and agricultural implements suitable for South Africa.

HYDRO-ELECTRIC PLANT FOR CATAMARCA, ARGENTINA.—Tenders will be received by the Argentine Board of Sanitary Works until June 28, according to the *Electrician*, for construction and equipment of a hydro-electric plant and substation for the town of Catamarca, Province of Catamarca.

CABLE AND ACCESSORIES FOR MORWELL (AUSTRALIA) POWER SCHEME.—Tenders will be received by R. Liddelow, secretary State Electricity Commission of Victoria, Melbourne, Australia, until June 17 for aluminum steel-cored cable and accessories (Specification No. 243.) Copies of tender form and specifications will be available upon application to the offices of the Bureau of Foreign and Domestic Commerce, Department of Commerce, First National Bank Building, Chicago, and 734 Custom House, New York City. The specification may be inspected at the above offices and also at the office of the Commissioner for Australia in the United States, Room 3,012, 61 Broadway, New York City.

EQUIPMENT POWER STATION AND WATER WORKS FOR BUENOS AIRES, ARGENTINA.—Tenders are being asked, the *Electrician* states, for equipment for three pumping stations, one power station and eight transforming substations for the Buenos Aires waterworks.

New Apparatus and Publications

STORAGE BATTERIES.—The General Lead Batteries Company, Chapel Street, and Lister Avenue, Newark, N. J., manufacturer of the "Titan" storage batteries, is distributing bulletin No. 34, entitled "Manifestations of Proper and Improper Battery Operation," in which its gives instructions regarding the care and use of storage batteries.

ELECTRIC MOTOR DRIVE AND CONTROL.—The Sprague Electric Works of General Electric Company, 527 West Thirty-fourth Street, New York City, is distributing bulletin No. 48,717, describing and illustrating the "Sprague" electric motor drive and control system for newspaper presses.

CIRCUIT BREAKERS.—The Cutter Company, Philadelphia, has issued a sixteen-page booklet covering its various remote-control circuits of both motor-driven and magnetically operated types, together with other apparatus especially adapted to central-station requirements.

GRAPHIC INSTRUMENTS.—"Getting Business with Graphics" is the title of bulletin 422 issued by the Esterline-Angus Company, Indianapolis, Ind. In this publication it calls attention to the possibilties of the use of graphic records in the sale of technical products.

PUMPS.—Bulletin 248 issued by the Dayton-Dowd Company, Quincy, Ill., describes and illustrates its type "CSU" multi-stage automatically balanced centrifugal pumps.

TRANSFORMER.—The Wappler Electric Company, Inc., 162 Harris Avenue, Long Island City, N. Y., has developed a transformer for control of high-voltage current and is designed particularly for X-ray and other inside work.

LIGHTING CODE.—The Westinghouse Lamp Company, 165 Broadway, New York City, has issued Bulletin E-103, which describes the lighting code for factories and mills as prepared by the Illuminating Engineering Society.

BRUSH MOUNTINGS.—The Rochester Electric Products Corporation, Rochester, has issued the first of a series of "Little Motor Talks," which takes up the matter of brush mountings. Other features of motor designs will be taken up in other issues from time to time.

RENEWABLE FUSE.—The Bussmann Manufacturing Company, 3819-25 North Twenty-third Street, St. Louis, is distributing an eight-page booklet describing the new knife-blade type "Buss" renewable fuse.

STRUCTURAL SLATE.—The Structural Slate Company, Pen Argyl, Pa., is distributing a booklet, entitled "Slate for Electrical Uses," which contains valuable research data and the results of a series of exhaustive tests made by Lehigh University on the electrical properties of slate.

New Companies

THE ASCUTNEYVILLE (VT.) ELECTRIC LIGHT CORPORATION has been incorporated by Seth N. Gage, C. H. Martin, A. L. Divoll, A. G. Hitchcock and George Fitch, all of Ascutneyville. The company is capitalized at $2,000 and proposes to furnish electricity in Ascutneyville and vicinity.

THE KENTUCKY-TENNESSEE FARM LIGHT & POWER COMPANY, Clarksville, Tenn., has been chartered with a capital stock of $1,000 by R. W. Harrison, J. H. Tate, J. B. Williams and others.

THE UTILITIES POWER COMPANY, Meredith, N. H., has been incorporated with a capital stock of $700,000 to construct a hydro-electric plant on the Pemigewasset River. The officers are: Herbert B. Rust, president; Bertram Blaisdell, treasurer, and Frank R. Prescott, clerk, all of Meredith.

THE STAUNTON POWER COMPANY, Boydton, Va., has been incorporated with a capital stock of $50,000 to supply electricity for lamps and motors in Halifax, Charlotte, Campbell, Lunenburg and other towns. D. F. Clark is president and E. L. Baptist secretary.

THE SOUTHAMPTON LIGHT & POWER COMPANY, Richmond, Va., has been incorporated with a capital stock of $5,000 to distribute electricity in Henrico and Chesterfield Counties. The officers are John H. Guy, Richmond, president, and D. W. Barrett, secretary.

THE AMASA (MICH.) LIGHTING COMPANY has been incorporated with a capital stock of $30,000 by Maurice E. Richards, Lewis T. Sterling and F. J. Engblom, all Iron Mountain, to furnish electricity in Amasa.

THE CLIFFS ELECTRIC COMPANY, Ishpeming, Mich., has been incorporated by M. M. Duncan, O. D. McClure and J. I. Keeton, all of Ishpeming. The company is capitalized at $10,000 and proposes to distribute electricity for lamps and motors in and around Ishpeming.

THE KENWOOD (OKLA.) WATER & LIGHT COMPANY has been chartered with a capital stock of $25,000 by J. W. Hoffman, Kansas City, Mo.; Arthur Day, St. Louis, and E. H. Brady, Muskogee, Okla.

Record of Electrical Patents

Notes on United States Patents

(Issued May 9, 1922)

1,415,186. PROCESS OF ELIMINATING COLOR FROM CAUSTIC ALKALI; Thomas C. Meadows and Herman D. Ruhm, New York, N. Y. App. filed Jan. 25, 1919. By electric current.

1,415,220. ELECTRICAL CONDENSER; Henry F. Causebrook, Greenfield, Mass. App. filed June 18, 1921. Tinfoil and paper type.

1,415,240. RESISTANCE UNIT; Lee P. Hynes, Albany, N. Y. App. filed July 13, 1921. Metallic ends adapted to be placed in spring clips.

1,415,256. CHIME-STRIKING ACTION; Leonard D. Morris, Chicago, Ill. App. filed Aug. 7, 1919. Operated by magnets.

1,415,275. STORAGE BATTERY; Norman D. Sturges, Bellerose, N. Y. App. filed Jan. 5, 1921. For preventing disintegration of plates.

1,415,284. REGENERATIVE MOTOR-CONTROL SYSTEM; Samuel T. Webster, St. Louis, Mo. App. filed Jan. 6, 1919.

1,415,309. ELECTRIC SYSTEM; Frank A. Byles, Schenectady, N. Y. App. filed June 12, 1919. Farm-lighting generator set.

1,415,321. ELECTRICAL APPARATUS; Eugene D. Eby, Pittsfield, Mass. App. filed Oct. 23, 1919. Bushing arrangement on high-tension oil-submerged apparatus.

1,415,382 AMPLIFIER; Joseph W. Milnor, New York, N. Y. App. filed Jan. 17, 1918. For amplifying submarine telegraphic signals.

1,415,385. GENERATING PLANT; Earl P. Oswald, Detroit, Mich. App. filed Oct. 24, 1918. Storage-battery reserve.

1,415,430. ELECTRIC MOTOR FOR TALKING MACHINES; William W. Dean, Newark, N. J. App. filed July 17, 1918. Motor geared direct to table shaft.

1,415,446. APPARATUS FOR MAKING ALUMINUM NITRIDE AND OTHER CHEMICAL SUBSTANCES; William Hoopes, Pittsburgh, Pa. App. filed Sept. 19, 1919.

1,415,456. ELECTRIC COOKING OR HEATING VESSEL; Clarence H. Lauth, London, England. App. filed Dec. 16, 1919. Shell of vessel used as element.

1,415,457. ELECTRICALLY HEATED LIQUID HEATER; Clarence H. Lauth, London, England. App. filed June 16, 1920. Low-voltage high current directly through containers.

1,415,466. ELECTROLYZER; Rudolphe Pechkranz, Carouge-Geneva, Switzerland. App. filed June 1, 1920. Of the open-tank type.

1,415,479. ELECTRICALLY HEATED FUSING IMPLEMENT; Edwin W. Putnam, Hartford, Conn. App. filed Oct. 28, 1921. Melts wax for sealing envelopes.

1,415,499. RECORDER; James N. Tuttle, Boston, Mass. App. filed Oct. 13, 1919. Heated stylus for curve-drawing instrument.

1,415,505. CURRENT TRANSFORMERS; Donald J. Angus, Indianapolis, Ind. App. filed June 28, 1920. Hole through core for additional primary turns.

1,415,521. MOTOR-STARTING DEVICE; George A. Burnham, Saugus, Mass. App. filed Aug. 2, 1918. Switch arrangement for auto-transformer.

1,415,524. METHOD OF MENDING ELECTRIC RESISTANCE ELEMENTS; Noel Carrico, Sidney, Mont. App. filed Jan. 22, 1921.

1,415,528. RECORDING INSTRUMENT; James R. Craighead, Schenectady, N. Y. App. filed Oct. 17, 1919. For measuring short-circuit currents.

1,415,531. ENGINE-STARTING APPARATUS; James K. Delano, New York, N. Y. App. filed Sept. 28, 1918. For airplane and truck engines.

1,415,534. VARIABLE RESISTANCE; Harold P. Donle, Meriden, Conn. App. filed Dec. 15, 1921. For radio panels.

1,415,539. METHOD AND APPARATUS FOR SUBMARINE SIGNALING; Reginald A. Fessenden, Brookline, Mass. App. filed July 20, 1917. For signaling and detecting submarines.

1,415,541. BATTERY; Oliver P. Fritchle, Denver, Col. App. filed April 2, 1920. Method of attaching cover.

1,415,550. ELECTRIC HEATING APPARATUS; William S. Hadaway, Jr., New Rochelle, N. Y. App. filed July 31, 1915. For industrial use.

1,415,564. MECHANICAL CONSTRUCTION OF ELECTRICAL MOTORS; John J. Holahan, Norfolk, Va. App. Nov. 2, 1920. Rotor readily taken out.

1,415,565. ARC-CURRENT REGULATOR; Joseph A. Holifield, Mobile, Ala. App. filed Nov. 20, 1919. For regulating arc-welding apparatus.

1,415,577. ADAPTED FOR MOTOR-BRUSH SHUNTS; David R. Knapp, Pottsville, Pa. App. filed Oct. 12, 1920.

1,415,588. JIG FOR USE IN ELECTRICALLY WELDING THE PARTS OF AUTOMOBILE BODIES AND OTHER STRUCTURES; Joseph Ledwinka, Philadelphia, Pa. App. filed July 1, 1919.

1,415,644. WINDING MECHANISM; Andrew J. Holmes, Tacoma, Wash. App. filed Jan. 25, 1921. For winding coils on cores integrally connected.

1,415,648. SELECTOR SWITCH; Carl A. W. Hultman, Stockholm, Sweden. App. filed Dec. 23, 1918. For automatic telephone exchange.

1,415,660. ELECTRIC HEATER; Richard G. Ledig, Philadelphia, Pa. App. filed Aug. 27, 1921. For heating or melting liquid or solid materials.

1,415,683. PROCESS OF TREATING SEPARATORS FOR STORAGE BATTERIES; Horace W. Nordyke, Indianapolis, Ind. App. filed April 26, 1921. To reduce natural content of acetic acid.

1,415,723. BIPOLAR MAGNETIC CHUCK; Frank L. Simmons, Woonsocket, R. I. App. filed Sept. 11, 1917.

1,415,748. ELECTRICAL RESISTOR; Ezechiel Weintraub, New York, N. Y. App. filed April 30, 1920. Possesses negative resistance characteristics.

1,415,770. ELECTRIC RADIATOR; Herbert H. Berry, London, England. App. filed May 3, 1921. Imitation coal fire.

1,415,774. ELECTRODE FOR ELECTRIC ARC WELDING AND METAL-CUTTING PURPOSES; William H. Boorne, London, England. App. filed March 28, 1921. Electrode coating forms a flux.

1,415,779. ELECTROSTATIC GENERATOR; William S. Bowen, New York, N. Y. App. filed March 30, 1920. Pulsating current generator using an electrostatic field.

1,415,804. STORAGE BATTERY AND METHOD OF MAKING IT; Walter H. Crissey, Reading, Pa. App. filed May 12, 1921. Hard-rubber rings around every other plate for separators.

1,415,807. SOUND-REPRODUCING DEVICE; Patrick B. Delany, South Orange, N. J. App. filed Feb. 1, 1918. Electrically reproducing sounds produced by phonograph.

1,415,832. BATTERY; Frank Garaca, Cleveland, Ohio. App. filed Oct. 15, 1918. Generates current when heated.

1,415,845. SELECTIVELY OPPOSING IMPEDANCE TO RECEIVED ELECTRICAL OSCILLATIONS; Michael I. Pupin, Norfolk, Conn. App. filed Feb. 10, 1916. Applies to wireless telegraphy.

1,415,848. TUBE-WELDING MACHINE; John W. White, Detroit, Mich. App. filed Aug. 25, 1920. For the manufacture of tubes.

(Issued May 16, 1922)

1,415,853. TELEPHONE EXCHANGE SYSTEM; Wallace P. Andrick, Hohokus, N. J. App. filed Oct. 25, 1920. Common telephone circuit for offices.

1,415,860. DEPOLARIZER FOR PRIMARY BATTERIES; Raymond C. Benner and Harry F. French, Fremont, Ohio. App. filed Aug. 22, 1918. Cuprous oxide mixed with sulphur.

1,415,868. TRANSMISSION EQUALIZATION ARRANGEMENT; Leo H. Darrow, New York, N. Y. App. filed Oct. 2, 1919. For telephone system.

1,415,875. ARMATURE WINDING; Alfred W. Houchin, Kirkwood, N. J. App. filed April 30, 1917. Split-core type.

1,415,907. MEANS FOR EQUALIZING TRANSMISSION OVER LINES OF DIFFERENT ELECTRICAL CHARACTERISTICS; George K. Thompson, Maplewood, N. J. App. filed Oct. 29, 1918. Telephone system.

1,415,971. MOTOR-CONTROL SYSTEM; John H. Albrecht, Pittsburgh, Pa. App. filed April 5, 1916. Automatic control of field excitation.

1,415,972. ELECTRICAL SWITCHING DEVICE; Roy M. Allen, Bloomfield, N. J. App. filed Aug. 13, 1920. Snap switch.

1,415,987. TROLLEY-WHEEL MOUNT; George O. Burwell, Detroit, Mich. App. filed Sept. 29, 1921. Springs bear on axle for better contact.

1,415,989. THREE-PHASE CRUCIBLE FURNACE; C. H. Carpenter, Irwin, Pa. App. filed May 22, 1920. Electric resistance type.

1,415,992. RECEIVING STATION; Lewis M. Clement, Newark, N. J. App. filed March 22, 1918. Radio-tube circuits.

1,415,993. ELECTRIC HEATING DEVICE; Ora A. Colby, Irwin, Pa. App. filed Aug. 30, 1920. Heating bars by passing current through them.

1,415,999. STATIC REDUCER FOR WIRELESS SIGNALS; Austen M. Curtis, Brooklyn, N. Y. App. filed Nov. 1, 1916. Crystal detector used with tubes.

1,416,007. ELECTRIC ARC WELDING SYSTEM; Otto H. Eschholz, Wilkinsburg, Pa. App. filed Oct. 6, 1919.

1,416,009. CONTROL SYSTEM FOR ELECTRIC RANGES; Frank F. Forshee, Flint, Mich. App. filed March 1, 1920.

1,416,024. SYSTEM OF CONTROL; Rudolf E. Hellmind, Swissvale, Pa. App. filed June 18, 1919. Pilot-motor-operated controller.

1,416,025. HEATING APPARATUS; Joseph I. Herbert, Chicago, Ill. App. filed July 29, 1920. Electrically heated radiators.

1,416,026. SYSTEM OF CONTROL; Lloyd J. Hibberd, Wilkinsburg, Pa. App. filed May 14, 1920. Resistor for accelerating polyphase motors.

1,416,045. ELECTRIC CURRENT COLLECTING DEVICE; Samuel S. Mathhes, Mansfield, Ohio. App. filed Oct. 17, 1921. For two-wire trackless trolley.

1,416,047. CONTROL APPARATUS; Harry R. Meyer, Wilkinsburg, Pa. App. filed June 9, 1920. Cell-type resistor for railway motors.

Construction News

Projects, Plans, Bids and Contracts; Contemplated or Under Way

New England States

PORTSMOUTH, N. H.—The Rockingham County Light & Power Company has issued $650,000 in bonds, part of the proceeds to be used for extensions and improvements.

WORCESTER, MASS.—One of the generators at the Webster plant of the Worcester Electric Light Company was recently damaged, causing a loss of about $20,000.

SHANNOCK, R. I.—The Columnia Narrow Fabric Company plans to erect a power house at its proposed new plant. Lockwood, Greene & Company, 60 Federal Street, Boston, are engineers.

FARMINGTON, CONN.—The Union Electric Light & Power Company has issued $100,000 in capital stock, the proceeds to be used for the installation of a new unit at its hydro-electric power plant and for other extensions and improvements.

WEST HARTFORD, CONN.—The construction of a new power house at the municipal filtration plant is under consideration.

Middle Atlantic States

AKRON, N. Y.—The Public Service Commission has granted the Genesee Light & Power Company, Batavia, permission to operate a high-tension transmission line in Akron. Electricity will not be distributed within the village limits, but service will be furnished in Newstead Township.

BINGHAMTON, N. Y.—Plans are being prepared by the Board of Supervisors of Broome County for the installation of electric lamps on the principal highways, to cost about $25,000.

BUFFALO, N. Y.—Bids will be received by John H. Meahl, Commissioner of Parks and Public Buildings, until June 12, for the erection of a power plant at the J. N. Adams Memorial Hospital, at Perrysburg, including power-house equipment, tunnels, conduit, etc.

BUFFALO, N. Y.—The Commissioner of Parks has authorized plans for the installation of ornamental lamps in Delaware Park and on the Bidwell, Jewett, Lincoln, Scajaquada and West Humboldt Parkways. The standards will be purchased by the city and service furnished by the Buffalo General Electric Company. The cost is estimated at from $35,000 to $50,000.

MASPETH, N. Y.—The New York & Queens Electric Light & Power Company, Long Island City, will build a substation, in Maspeth, to cost about $50,000.

WEST WINFIELD, N. Y.—The property of the West Winfield Electric Company has been purchased by the Madison Power Company, Utica. Electricity to operate the local system will be secured from Utica, and a twenty-four-hour service, it is expected, will be established.

PATERSON, N. J.—The Paterson & Passaic Gas & Electric Company has received permission from the Board of Public Utility Commissioners to issue $50,000 in bonds for extensions and improvements.

LYNN, PA.—The Lynn Light & Power Company will install a distributing system at Wanamakers.

PETERSBURG, PA.—The Warrior Ridge Power Company contemplate the erection of a transmission line from Petersburg to Mooresville, with a distributing system in the Shavers Creek Valley district, Mooresville and vicinity.

PHILADELPHIA, PA.—The McCahan Sugar Refining Company will build a power house at its plant at Tasker Street and Delaware Avenue, to cost about $45,000.

POTTSVILLE, PA.—The Eastern Pennsylvania Light, Heat & Power Company has acquired a site at Pinegrove, for a new generating plant to cost about $2,000,000. When completed power plant in Pottsville will be held for reserve service. New transmission lines will be built.

TOPTON, PA.—The Topton Electric Light & Power Company will extend its transmission line from Longswamp to Shamrock.

WOODBURY, PA.—The Woodbury Township, Taylor Township and Bloomfield Township Power Companies, recently organized by C. A. McClure and F. W. Woodcock, are planning to install distributing systems in the different districts. A main transmission line will be built. The companies are represented by James J. Collins, Bullitt Building, Philadelphia.

WILMINGTON, DEL.—The Wilmington Sugar Refining Company, Christiana Avenue and B Street, will build a power house at its new local refinery, in course of erection. W. J. Wayte, Inc., 125 East Forty-sixth Street, New York, is engineer.

BALTIMORE, MD.—Extensions and improvements are contemplated to the municipal power plant at Bay View, to cost about $40,000. C. L. Reeder, 916 North Charles Street, is consulting engineer.

BALTIMORE, MD.—Bids will be received by the Board of Awards, office of the City Register, City Hall, until June 7, for incandescent lamps for the various municipal departments. J. Reese Pitcher is city purchasing agent.

BALTIMORE, MD.—The Baltimore & Ohio Railroad Company contemplates the construction of two hydro-electric power plants, one on the North Branch of the Potomac River, near Bloomington, and the other on the Cheat River, near Rowlesburg, W. Va., in connection with the proposed electrification of its Cumberland division, for which surveys are being made.

BUCKHANNON, W. VA.—The Peck's Run Coal Company is considering plans for the rebuilding of its power plant recently destroyed by fire, causing a loss of about $27,000.

WASHINGTON, D. C.—Bids will be received by the Commissioners of the District of Columbia, District Building, until June 5 for construction of power house at the Gallinger Hospital, including equipment and radial brick stack.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until June 13, for twenty centrifugal separators, electrical and mechanical spare parts, including motors and control panels for battleships (Schedule 9667).

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until June 13, for alternating-current generators in lots of 15, 30 and 50, for Anacostia, D. C., and Philadelphia, Pa. (Schedule 9672).

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Engineer, United States Army, Munitions Building, until June 8, for motor-generators in lots of 1, 100, 110, 120 and 150; motor-generator equipments in lots of 10, 20, 30 and 50, and dynamotors in lots of 35, 40, 45 and 60. (Circular PR 11,000—1CP.) Also until June 10, for five alternating-current induction motors, 10 hp., and five starting compensators for same. (Circular PR 11,507—1 CP.)

WASHINGTON, D. C.—Bids will be received at the office of the Chief Signal Officer, United States Army, Munitions Building, until June 12, for a quantity of radio and telephone supplies (Circular PR 11,000—3 ACP). Also for telephone switch-

board apparatus (Circular PR 10,903—1CP). Also, until June 12, for 1,000 common-battery telephone (Circular PR 11,487—1 CP).

North Central States

ANN ARBOR, MICH.—The trustees of the University of Michigan have awarded a general contract to H. G. Christman, Stephens Building, Detroit, for a four-story and basement building, 190 ft. x 235 ft., to be equipped as engineering and mechanical shops and laboratories, to cost, with equipment, about $750,000. Shirley Smith is secretary.

DETROIT, MICH.—The Detroit Edison Company is completing plans for a one-story addition to its service building at Second Street and Elizabeth Avenue. Plans are also under way for improvements in the power house at Ypsilanti to cost about $27,000.

GRAND RAPIDS, MICH.—The American Seating Company contemplates the construction of a 2,000-hp. power plant and a four-story warehouse 400 ft. long.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioner of purchases and supplies, City Hall, until June 9 for series multiple transformers and for constant-current regulating transformers.

GRANDVIEW, OHIO.—The Council has approved plans for a new street-lighting system. Walter H. Whissen is clerk.

HAMILTON, OHIO.—The Froelich & Emery Engineering Company, Second National Bank Building, Toledo, has submitted a report to the City Council recommending the construction of a new municipal electric light plant, to cost about $687,288, and improvements to the electric lighting distribution service, to cost about $105,770. Improvements in the waterworks plant, to cost $159,810, were also recommended.

SANDUSKY, OHIO.—The Sandusky Gas & Electric Company has issued $300,000 in capital stock, part of the proceeds to be used for extensions and improvements.

OWENSBORO, KY.—The Field Packing Company will build a new power house in connection with its proposed cold-storage plant.

INDIANAPOLIS, IND.—The Interstate Public Service Company has been granted permission by the Public Service Commission to issue $372,000, in capital stock, part of the proceeds to be used for extensions and improvements.

INDIANAPOLIS, IND.—The Indiana Refrigerating Company, 232 South Pennsylvania Street, is planning to rebuild a portion of its power department and refrigerating building recently destroyed by fire, causing a loss of about $80,000, including machinery.

SOUTH BEND, IND.—The Indiana-Michigan Electric Company will build a one-story-and-basement addition to its local power plant, 50 ft. x 50 ft.

CHICAGO, ILL.—The Chicago, Burlington & Quincy Railroad Company, 547 West Jackson Boulevard, Chicago, is considering the construction of power plants at Alliance and McCook, Neb., each 48 ft. x 60 ft.

CHICAGO, ILL.—Plans are being prepared by the Commonwealth Edison Company for two new substations, one to be located at 750 West Adams Street, 50 ft. x 190 ft., and the other at 4712 Prairie Avenue, 35 ft. x 75 ft.

SPRINGFIELD, ILL.—The Commonwealth Power Corporation, recently organized to operate electric properties in Michigan, Ohio, Indiana and Illinois, has arranged for a bond issue of $12,500,000, part of the proceeds to be used for extensions and improvements.

BIG FALLS, WIS.—The Lake Superior District Power Company has issued $1,345,000 in bonds, part of the proceeds to be used for extensions and betterments, including the completion of its local hydro-electric power plant, with an initial capacity of 8,000 hp., which will be increased later to 12,000 hp. The project includes an 88,000-volt transmission line. L. E. Myers is president.

MANITOWOC, WIS.—Bids will be received by the Board of Education until June 15 for the proposed new central high school building, with a separate heating and power plant, including vocational training shops.

CEDAR RAPIDS, IOWA.—The Iowa Railway & Light Company, Boone, Iowa, contemplates the construction of hydro-electric plant and dams on the Des Moines River.

OTTUMWA, IOWA.—Plans are under way for the installation of an ornamental lighting system in the business district. M. A. Sheehan is clerk.

SHENANDOAH, IOWA.—The Continental Gas & Electric Corporation has issued $1,500,000, in bonds, part of the proceeds to be used for extensions and improvements.

JEFFERSON CITY, MO.—The Jefferson City Light, Heat & Power Company will take bids at once for extensions to its power plant, to cost about $45,000.

LEOTI, KAN.—Bonds to the amount of $24,000 has been voted for a municipal electric light plant.

Southern States

GREENSBORO, N. C.—Bids will be received by the City Council until June 8 for the construction of a dam across Reedy Fork Creek to develop an impounding reservoir and for the installation of an auxiliary power plant. The equipment will include a pumping unit, consisting of a 3,500-gal.-per-minute centrifugal pump to operate under a 156-ft. head, connected to twin horizontal turbines operating under 12-ft. to 14-ft. head. P. C. Painter is city manager.

JACKSON, N. C.—The Council of Jackson has awarded a contract to George A. Sanderford, Franklin, Va., for the construction of a municipal lighting system, including power house, distribution and street-lighting system. Henry B. Reardon, Norfolk, Va., is consulting engineer.

HOMESTEAD, FLA.—Extensions and improvements are contemplated to the municipal electric plant, to cost about $50,000.

LAKELAND, FLA.—The Non-Acid Fertilizer & Chemical Company will build a power plant in connection with its proposed new local factory. H. E. Memminger is engineer and general manager.

MOBILE, ALA.—The Mengel Company, Louisville, manufacturer of boxes, etc., is considering establishing a new plant in the vicinity of Mobile, consisting of a sawmill, planing mill with electric haulage system, hoisting machinery, etc., to cost about $500,000. T. F. Faust, Mobile, representative, is in charge.

TUSKEGEE, ALA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 22 for boiler plant (except building and smokestack), including outside heating, electric water and sewer services; the deep wells, pumping plant and water supply systems, and the sewage disposal plant for the United States Veterans' Hospital, Tuskegee.

MONROE, LA.—The Singer Sewing Machine Company, 149 Broadway, New York, will build a power plant in connection with its proposed new lumber and woodworking mill in Monroe, to cost about $500,000.

OKLAHOMA CITY, OKLA.—An ordinance has been adopted by the City Commissioners providing for the electrification of all railroads entering the city, effective Nov. 1. Among the railroads affected are the Atchison, Topeka & Santa Fé, St. Louis & San Francisco, Missouri, Kansas & Texas and the Chicago, Rock Island & Pacific.

TULSA, OKLA.—The Mid-West Utilities Company, 72 West Adams Street, Chicago, will soon commence the erection of a power plant at Tulsa, to cost about $500,000. Sargent & Lundy, 72 West Adams Street, Chicago, are engineers.

DALLAS, TEX.—Plans are under way by the Stickle Lumber Company for the construction of ten buildings, including sawmill, planing mill, power house, machine shops, etc., to cost with equipment about $350,000. The plans also include a logging railroad.

HARLINGTON, TEX.—Improvements are being made to the municipal electric light plant, including the installation of a 200-hp. Fairbanks-Morse Diesel type engine directly connected to a 150-kw. generator. C. A. Crippe is manager of water and light department.

Pacific and Mountain States

NEWPORT, WASH.—The Bead Lake Gold-Copper Mining Company, Spokane, contemplates the erections of a transmission line to its mill north of Newport.

SEATTLE, WASH.—The Puget Sound Power & Light Company will build a new transmission line on the Mercer Island Boulevard.

SEATTLE, WASH.—Arrangements have been made for interconnection of the municipal plants of Seattle and Tacoma. A transmission line will be erected at a cost of $150,000 to tie in the two systems, each city to defray one-half the cost. A new substation will be built on West Spokane Street, Seattle, and a transmission line extended to this point. The cost to the city of Seattle is estimated at $123,000.

SPOKANE, WASH.—The erection of 100 miles of new transmission lines and rebuilding other lines in Palouse County this summer is planned by the Washington Water Power Company. The proposed work includes 60 miles of 110,000-volt transmission line from Lind to Colfax and 40 miles of 60,000-volt line from Colfax to Pullman.

CORVALLIS, ORE.—The installation of a new street-lighting system in the business section of the city is under consideration by the business men.

EUGENE, ORE.—Permission has been granted to the city of Eugene by the State Engineer for permission to appropriate 400 second-feet of water from McKenzie River for the development of electricity for light and power purposes. The cost is estimated at $120,000.

HOOD RIVER, ORE.—Preparations are under way by the Pacific Light & Power Company, Portland, it is reported, for the construction of a 6,000-kw. hydro-electric plant on Hood River, a short distance from here, to cost about $1,250,000.

RIDDLE, ORE.—At a recent election a bond issue was voted for the installation of an electric light plant and an auxiliary water system.

AUBURN, CAL.—The American River Water & Power Company, recently organized, is planning to construct a transmission and distributing system in western Placer County. James E. Walsh heads the company.

PLACERVILLE, CAL.—The El Dorado Water Corporation contemplates the construction of a hydro-electric plant in connection with its Webber Creek irrigation project.

SAN FRANCISCO, CAL.—James P. Sweeney, Nevada Bank Building, and associates have been granted permission by the State Water Commission to construct and operate a hydro-electric power plant on the Mokelumne River, Amador County, to develop about 35,000 hp. The cost is estimated at about $5,000,000.

MURTAUGH, IDAHO.—Arrangements have been made between Harvey Hall of the Ball Electric Company, Burley, and the citizens and farmers of the town of Murtaugh whereby the former will erect an electric transmission line from Hansen to Murtaugh and supply electricity in Murtaugh and to residents along the line. At Hansen the line will connect with the system of the Idaho Power Company from which electricity will be secured. The transmission line will be operated by Mr. Ball, under the name of the Murtaugh Light & Power Company.

MISSOULA, MONT.—Work will begin at once on the erection of a central power house at the University of Montana, to cost about $110,000.

PIOCHE, NEV.—The Dixie Power Company, St. George, Utah, is considering extending its transmission lines to supply electricity in Pioche, Caliente and other communities in Lincoln County. It is about 35 miles from the nearest line of the company to this section.

Canada

EDMONTON, ALTA.—Extensions to the municipal electric light plant, to cost about $75,000, are under consideration.

BRANTFORD, ONT.—A by-law providing for appropriating $65,000 for extensions and improvements to the municipal hydro-electric system has been approved by the City Council.

CREDITON, ONT.—Contract has been awarded to the Ontario Hydro-Electric Power Commission for the installation of an electric lighting power system in Crediton to include a 3-mile transmission line. The cost is placed at $35,000.

NEW LISKEARD, ONT.—Work, it is reported, has started on a 6,000-hp. hydro-electric development at Indian Chutes on the Montreal River, 12 miles above the town of Elk Lake, for the Matachewan River Power Company, Ltd. Sutcliffe & Neelands, Ltd., New Liskeard, are engineers.

Miscellaneous

PEARL HARBOR, H. T.—Plans are under consideration by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for extensions to power house at Pearl Harbor and also to power house at Heela. (Specification 4,639.)

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co., Birmingham, Ala.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, C. E. Drayer, 63 East Adams St., Chicago, Ill.

AMERICAN ASSOCIATION OF OPERATING ENGINEERS. Secretary. H. C. Bristol, Calderwood, Tenn.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Executive secretary, J. W. Welsh, 8 West 40th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY. Acting secretary, A. D. Spillman, Lehigh University, Bethlehem, Pa.

AMERICAN ENGINEERING STANDARDS COMMITTEE. Secretary, P. G. Agnew, 29 West 39th St., New York City.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 143 Liberty St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York City. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual convention, Niagara Falls, Ontario, June 26-30.

AMERICAN PHYSICAL SOCIETY. Secretary, Dayton C. Miller, Case School of Applied Science, Cleveland, Ohio.

AMERICAN SOCIETY FOR TESTING MATERIALS. Secretary-treasurer, C. L. Warwick, 1315 Spruce St., Philadelphia, Pa. Annual meeting, Atlantic City, N. J., June 26 to July 1.

AMERICAN WELDING SOCIETY. Secretary, M. M. Kelly, 29 West 39th St., New York City.

ARKANSAS UTILITIES ASSOCIATION. Secretary, R. I. Brown, Little Rock Railway & Electric Company, Little Rock, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42d St., New York City. Annual meeting, Spring Lake Beach, N. J., June 19-25.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Preston S. Millar, 80th St. and East End Ave., New York.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa. Annual meeting, Cleveland, Ohio, Sept. 11-15.

ASSOCIATION OF MUNICIPAL ELECTRICAL UTILITIES OF ONTARIO. Secretary, S. R. A. Clement, 190 University Ave., Toronto. Convention, Niagara Falls, Ont., June 22-24.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Room 413, C. & N. W. Terminal Station, Chicago, Ill.

BRITISH COLUMBIA ELECTRICAL CO-OPERATIVE ASSOCIATION. Field manager, R. E. Chatfield, 108 B. C. Electric Bldg., Vancouver, B. C.

CANADIAN ELECTRICAL ASSOCIATION, affiliated with N. E. L. A. Secretary-treasurer, Eugene Vinet, Shawinigan Water & Power Co., Montreal, Canada. Annual convention, Ottawa, June 15-17.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, Miss Minnie B. W. Baker, 900 15th St., Denver, Col.

ELECTRIC HOIST MANUFACTURERS' ASSOCIATION. Secretary-treasurer, E. Donald Tolles, 165 Broadway, New York City.

ELECTRIC POWER CLUB. Executive secretary, S. N. Clarkson, 506 Laclede Gas Building, St. Louis, Mo. Annual meeting, Hot Springs, Va., June 5-7.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, F. L. Bishop, Hartford Faience Co., Hartford, Conn.

ELECTRICAL MANUFACTURERS' COUNCIL. Executive secretary, Frederic Nicholas, 522 Fifth Ave., New York City.

ELECTRICAL SAFETY CONFERENCE. Secretary, Dana Pierce, 25 City Hall Place, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton, Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, ATLANTIC DIVISION. Secretary, E. Donald Tolles, 165 Broadway, New York City.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION, PACIFIC COAST DIVISION. Secretary, Albert H. Elliot, 502 Flatiron Building, San Francisco, Cal.

ELECTRICAL TRADE ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Canada.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, Grand Central Terminal Building, New York City.

FLORIDA ENGINEERING SOCIETY. Secretary, J. R. Benton, Gainsville, Fla.

GREAT LAKES GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, R. V. Prather, 305 Illinois Mine Workers Bldg., Springfield, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary-treasurer, R. V. Prather, 305 Illinois Mine Workers Bldg., Springfield, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law, 29 West 39th St., New York City. Sections in New York, Philadelphia, Chicago and Boston. Chapters in San Francisco, Cleveland and Toronto. Annual meeting, Boston, Sept. 25-28.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donohue, Lafayette, Ind.

INSTITUTE OF RADIO ENGINEERS. Secretary, Alfred N. Goldsmith, College City of New York, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex. Convention, New Bedford, Mass., Aug. 22-25.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA SECTION, N. E. L. A. Secretary, W. G. Linn, Des Moines Electric Co., Des Moines, Iowa. Annual meeting, Lake Okoboji, Iowa, June 20-22.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer T. T. Parker, Kansas Electric Utilities Co., Emporia, Kan.

KENTUCKY ASSOCIATION OF PUBLIC UTILITIES. Secretary, E. F. Kelly, Louisville Railway, Louisville, Ky.

MICHIGAN ELECTRIC LIGHT ASSOCIATION. Secretary, Herbert Silvester, Edison Bldg., Ann Arbor, Mich.

MIDDLE WEST DIVISION, N. E. L. A. Secretary-treasurer, Horace M. Davis, Bankers' Life Bldg., Lincoln, Neb.

MISSISSIPPI ELECTRIC ASSOCIATION, affiliated with the N. E. L. A. Secretary, W. A. Sullivan, Gulfport & Mississippi Coast Traction Co., Gulfport, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, 315 North 12th St., St. Louis, Mo.

NATIONAL ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, Farquson Johnson, 15 West 37th St., New York City, N. Y. State associations in Alabama, Arkansas, Connecticut, Georgia, Kansas, Illinois, Indiana, Iowa, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Missouri, New Jersey, New York, Ohio, Oregon, Pennsylvania, Tennessee and Wisconsin. Also members in Canada and unorganized states.

NATIONAL COUNCIL LIGHTING FIXTURE MANUFACTURERS. Secretary, Chas. H. Hofrichter, 23 Gordon Square Bldg., West 65th St. and Detroit Ave., Cleveland, Ohio. Annual meeting, Cleveland, June 28-29.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Executive secretary, T. H. Day, 59 Deerfield Ave., Hartford, Conn.

NATIONAL ASSOCIATION OF RAILWAY AND UTILITY COMMISSIONERS. Secretary, James B. Walker, New York Transit Commission, New York City.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive manager, M. H. Aylesworth, 29 West 39th St., New York City.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1350 Marquette Building, Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Chairman of electrical committee, Dana Pierce, 25 City Hall Place, New York City. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, Horace M. Davis, Bankers' Life Bldg., Lincoln, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, James A. Loring, 161 Devonshire St., Boston, Mass.

NEW ENGLAND GEOGRAPHIC DIVISION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass. Annual convention, New London, Conn., Sept. 5-7.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, Charles E. Twogood, Albuquerque, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, W. J. Kreger, 47 West 34th St., New York City.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York City.

NORTH CENTRAL ELECTRIC ASSOCIATION, GEOGRAPHIC DIVISION, N. E. L. A. Secretary, H. E. Young, Minneapolis General Electric Co., Minneapolis. Annual meeting, St. Paul, Minn., June 13-15.

NORTHWESTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, J. F. Orr, Idaho Power Co., Boise, Idaho. Annual meeting, Boise, Idaho, June 7-10.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual convention, Cedar Point, Ohio, July 11-14.

OKLAHOMA UTILITIES ASSOCIATION. Acting secretary, O. D. Hall, Oklahoma City.

ONTARIO ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary, J. A. McKay, 24 Adelaide St. West, Toronto, Ont.

PACIFIC COAST GEOGRAPHIC DIVISION, N. E. L. A. Secretary, S. H. Taylor, 527 Rialto Bldg., San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION. State Section N. E. L. A. Secretary, H. M. Stine, 212 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, R. M. Booker, Newport News & Hampton Railway, Gas & Electric Co., Hampton, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, A. Bliss McCrum, Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, Renville H. McMann, 150 Nassau St., New York City.

ROCKY MOUNTAIN GEOGRAPHIC DIVISION, N. E. L. A. Treasurer, A. C. Cornell, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. Assistant to the president, W. L. Goodwin; secretary, Theo. E. Burger, 522 5th Ave., New York City. Annual meeting second Tuesday in May; directors' meetings second Tuesday in May and November; executive committee meetings every sixty days.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTHEASTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary-treasurer, Charles A. Collier, Georgia Railway & Power Co., Atlanta, Ga.

SOUTHWESTERN GEOGRAPHIC DIVISION, N. E. L. A. Secretary, H. A. Lane, Oklahoma Utilities Association, 1106 First National Bank Bldg., Oklahoma City, Okla.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, E. N. Willis, 403-4 Slaugher Bldg., Dallas, Tex.

TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. F. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. E. Warsaw, Burlington, Vermont.

WEST VIRGINIA-KENTUCKY ASSOCIATION OF MINE, MECHANICAL AND ELECTRICAL ENGINEERS. Secretary-treasurer, Herbert Smith, 211 Hobson-Pritchard Bldg., Huntington, W. Va.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 West Jackson Blvd., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. S. Nethercut, 1735 Monadnock Block, Chicago, Ill.

WISCONSIN UTILITIES ASSOCIATION. Executive secretary, John S. Cadby, Madison, Wis.

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